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The Impact of variable data print on usability in design

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Problem Statement

In a world where people see, process and remember information differently, the question arises: Is technology being used in a manner that acknowledges and addresses user differences to the fullest extent? Currently, new print technologies like Variable Data Printing (VDP) are only being used to create customized direct mailing pieces and personalized products for the purpose of marketing, sales and promotion. However, VDP introduces the ability to change data and design elements in printed documents on an individual basis, making it possible to address differences in visual and cognitive abilities, language and culture, and situational considerations. Applying this concept of customization to educational or informational documents would allow a small amount of input from a user to influence unique output (different sequences or layouts, typographic decisions and appropriate content choices) that are more relevant, usable and engaging. While using VDP as a means to explore and achieve this customization, the focus of this thesis study would not be the technology, but the development of a graphic design strategy that also accommodates this customization goal to make information more accessible and usable on an individual basis.

Project Relevance and Importance

Whether due to practical constraints, lack of knowledge, or other factors, designers may not always be able to address user differences in their projects. This means that considerations related to visual or cognitive abilities, language and culture, or situational considerations are often lacking. This results in design solutions that may seem strong on the surface but fail to address the individual needs of a diverse range of users. An approach to design called *Universal Design* aims to create design solutions that are usable by the greatest possible audience. Although intended to be inclusive, this approach can sacrifice depth and richness of content by generalizing or simplifying information. Instead of creating a single solution that generalizes to the lowest common denominator or creating a multitude of versions to address the many differences, VDP introduces the option of creating a single design that is customized as needed for each user.

As a recent development in digital printing technology, VDP parallels the development of customizable webpages on the World Wide Web. Whereas webpages have been actively employing computer technologies to allow variable content and address accessibility issues, print design has only recently started to explore the possible applications of customizing data and design. Currently, VDP focuses primarily on targeted marketing campaigns, financial transactional documents and customized merchandise, but can and should also be used toward other types of meaningful, useful applications.

Key Questions

Do people read documents differently? If so, what factors are influential?

Can differences in thinking and learning styles be mediated through customized design solutions?

Will customized documents make information more accessible and/or usable to individuals?

What level of customization will be appropriate in addressing user differences?

Which types of materials would be viable and useful in a customized format?

What are the inherent constraints of print that may impact its customization?

How will graphic design accommodate this customizing while maintaining its integrity?

Will the benefits of on-demand VDP be worth the costs?

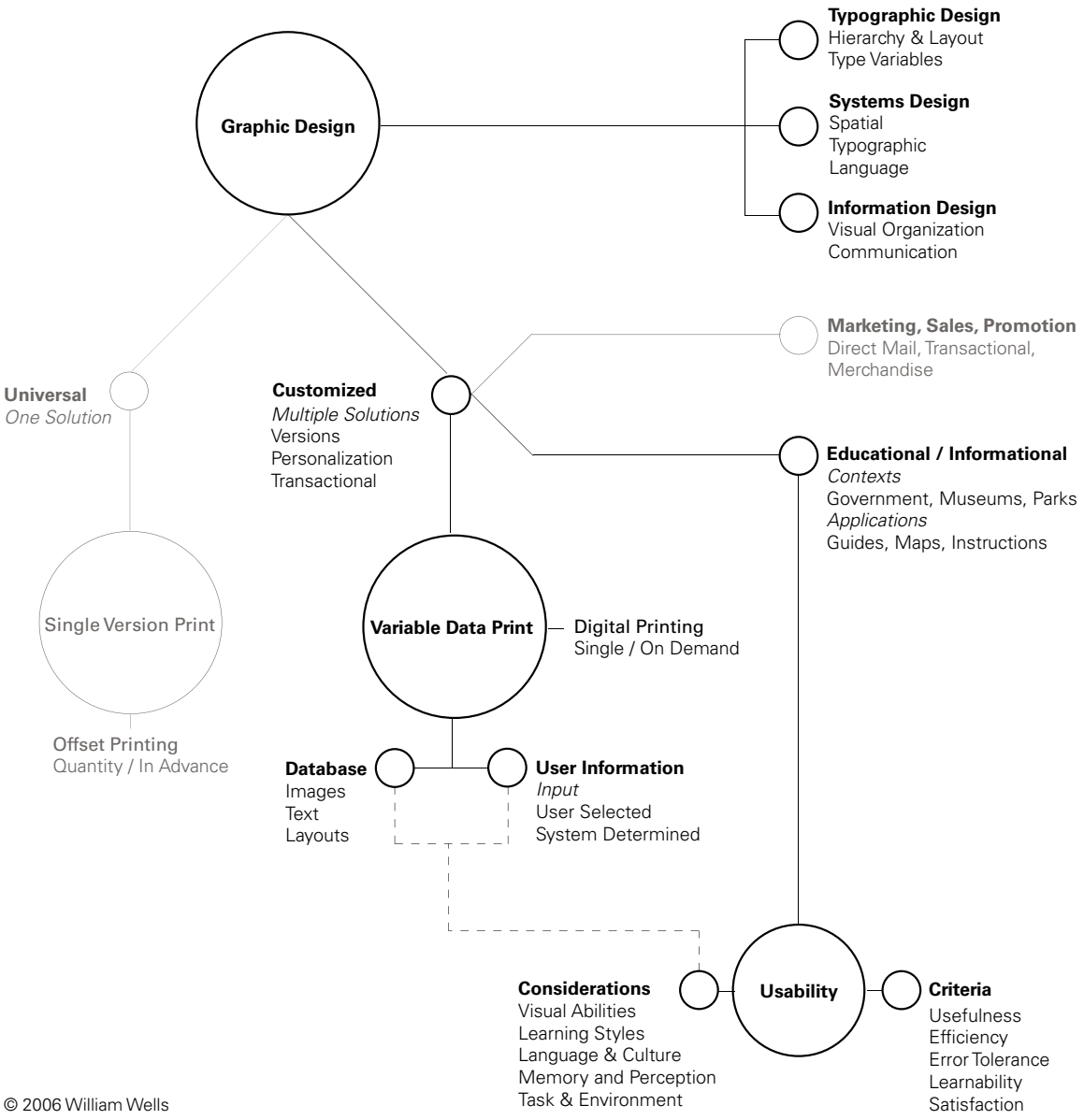
Associated Areas of Study

Usability & Accessibility	Universal Design	Variable Data Printing
Language & Culture	Systems Design	Print On-Demand
Learning Styles	Information Design	Database Publishing
Memory and Perception	User Interface Design	Customization
Visual Abilities	Typographic Design	

Potential Applications

If applied toward usability and accessibility, VDP has the potential to create documents that are tailored according to the needs of each user. Using on-demand customization in this manner will be most helpful in situations with a large, diverse user group. Possible areas of use and related applications include museum guides, governmental forms, product instructions and teaching materials. This thesis study will culminate with a design application that uses VDP to implement a variable, but systematic, design solution. By using VDP customization to address issues of user differences these documents will be more accessible and usable, and foster greater inclusiveness.

Explanatory Diagram



Precedent A

Gestalt Principles for Document Design

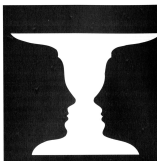
Description

In the chapter entitled *Using Gestalt Principles to Understand Readers Interpretations of Spatial Cues* of her book *Dynamics in Document Design: Creating Text for Readers,* Karen Schriver illustrates how Gestalt principles relate to document design. Gestalt principles, which are based on human psychology and visual perception, play important roles in the perceptual process between the visual organization of content and the reader. These principles explain how individual elements on the page are perceived and understood in relation to each other. With research, examples and case studies, Schriver's book provides an insightful look at how designers can use these principles to practically address real user needs.

The following quotes from this source, one from each subsection of the chapter, provide concise explanations of each of the Gestalt principles:

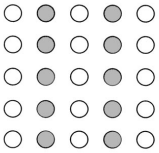
Perception is an Active Process

"When people look at a page, a picture, a computer screen, or the environment around them, they actively organize what they see. They resolve ambiguities, impose structure, and make connections. They make use of all of the visual cues in the visual field to help them in constructing meaning for the content." (Schriver, 304)



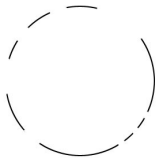
People Organize What They See into Figure and Ground

"The figure is generally the focus of attention and is seen as a whole since it is surrounded by a contour. The rest of the field is the ground which is apt to be in the margin of attention and is usually seen as further away [or behind] the figure. However, the space around, between and within the figure can be employed to show rhetorical relationships among the content elements as well as provide continuity, emphasis, and an elegant appearance." (Schriver, 306)



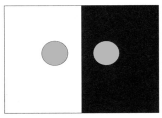
How People Group Figures Depends on the Visual Properties of the Figures

"Document designers need to consider how the design of contrasting visual cues encourages readers to group the content. They need to evaluate whether the grouping helps readers to make reasonable (and appropriate) inferences about the internal relationship among the parts of the document." (Schriver, 309)



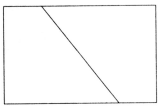
How People Group Figures Depends on Good Continuation

"The Gestalt principle of good continuation says that graphic elements that suggest a continued visual line tend to be grouped together. In addition, visual patterns with good continuation may suggest to the viewer that the pattern continues beyond the end of the pattern itself." (Schriver, 313)



How a Figure Looks Depends on its Surroundings

"The various parts of the visual field interact and influence one another. The perceived size, brightness, and shape of a figure depends on its surrounding, on other figures in the neighborhood." (Schriver, 315)



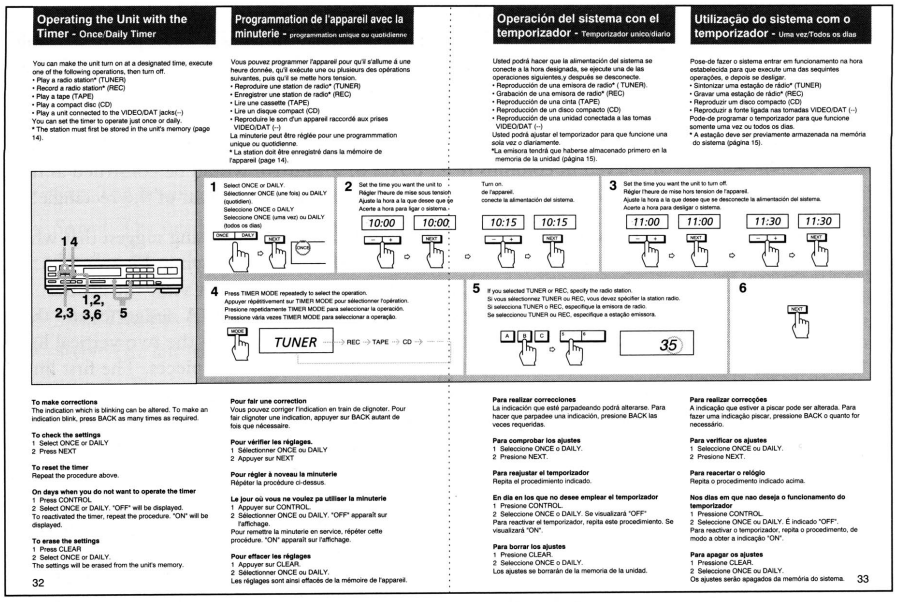
Strong Figures Are Stable

"Some figures are more resistant to contextual influences that others. These strong figures tend to share the properties of simplicity, regularity, closure, and symmetry. Strong figures resist change or disintegration under poor viewing conditions or variations in the viewer's attention." (Schriver, 316)

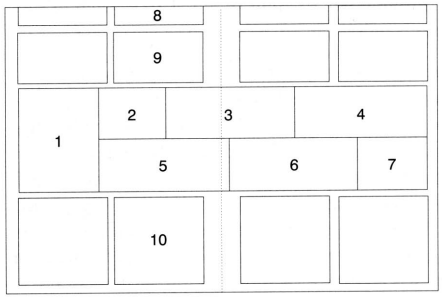
Precedent A

Gestalt Principles for Document Design (continued)

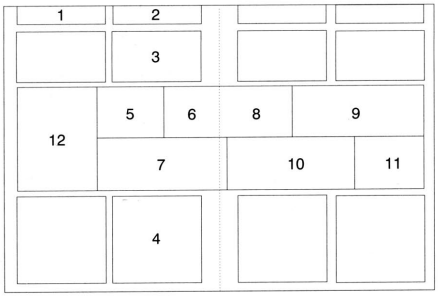
Example of Gestalt in VCR Instructions



How Document Designers Thought Bilingual Readers Would Scan the Text



How French-English Bilingual Readers Tended to Scan the Text



This multilingual spread from an instruction manual for a stereo system is an example of how Gestalt principles affected how users read documents. This example illustrates several of the principles, including figure / ground relationships, continuation, strong figures and interacting page elements. The framed horizontal rectangle with diagrams in the example on the top was intended to be seen as a single strong, stable figure. However, the lines within the rectangle made the figure weaker and caused users to consider the subdivisions separately. The strong vertical text columns, which may be perceived as the ground, have a strong sense of continuation behind the rectangle with illustrations. (See Appendix A for a larger version.)

Significance

This book's explanations provide an excellent guide to the influence Gestalt principles have on readers. Its impact on this thesis is multi-faceted. First, it helps establish which design elements can be used and adjusted to provide effective spatial cues to different readers. Second, it provides tools and considerations for how to coordinate changing design elements with static elements to ensure that the varying layouts remain cohesive and consistent.

Source

Dynamics in Document Design: Creating Text for Readers, Karen A. Schriver

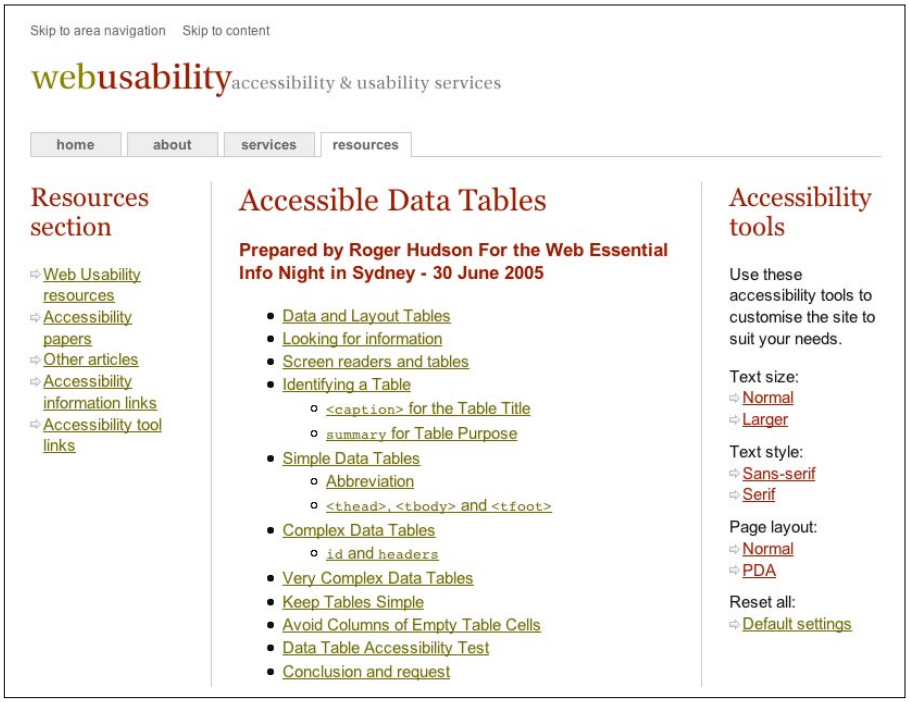
Precedent B
Web Accessibility and Usability

Description

The Internet has undergone rapid advances in technology that make it potentially difficult for everyone to use equally. New multimedia tools like Flash and Javascript often add interactivity and graphical interfaces that exclude users that depend upon text readers or simple, clear layouts with contrasting elements to access information. Fortunately, many advocates have placed this issue as a priority and much progress has been made in making the Internet more usable and accessible. Although many approaches relate specifically to adjusting elements to fit on screens and provide alternate navigation devices, many more address issues that relate to general topics like readability, legibility and comprehension. The U.S. Government website on usability provides many models and processes to follow in analyzing, designing and testing websites for usability. Well-known usability advocate, Jacob Nielsen, has a website that presents his findings on web usability by outlining the issues, the research behind them and many solutions. Even large corporations like Microsoft have taken this issue seriously. This accessibility website provides excellent descriptions of the various user challenges and technical issues involved in making the Internet accessible to all.

Significance

The issues of usability and accessibility on the Internet have many correlations to Variable Data Print and print customization. Precedent B is important to this thesis study because most of the issues and solutions addressed in web usability can also be applied to print, as in the adjustment of type size or varying page layouts based on format or user goals. Of special interest to this thesis are the measures being taken to ensure that websites with highly variable content maintain their design integrity.



This screenshot from *http://www.usability.com.au* includes accessibility tools in the right column which show how websites can be adjusted quickly and easily for different abilities and needs.

Sources

U.S. Government Resource on Usability, *http://www.usability.gov*
Jakob Nielsen on Usability and Web Design, *http://www.useit.com*
Microsoft Accessibility, *http://www.microsoft.com/enable/*

Precedent C

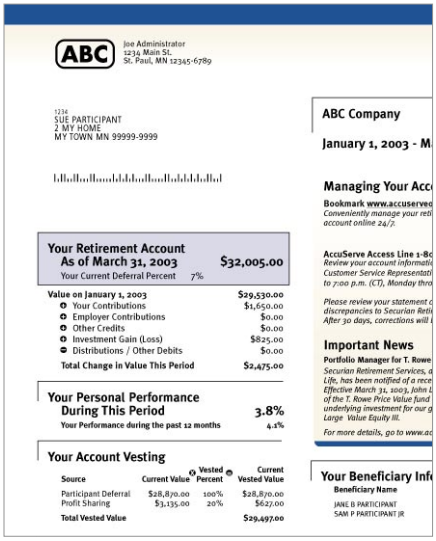
Securian Financial Group Newsletter

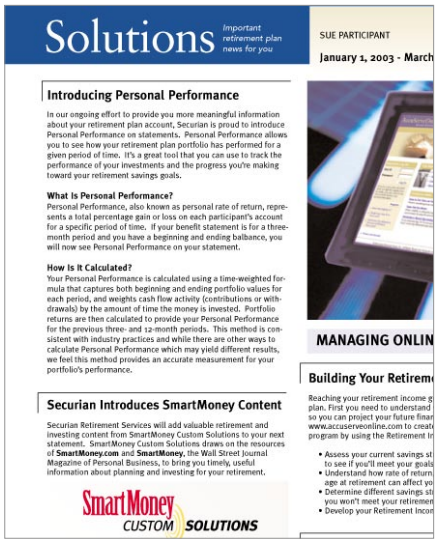
Description

Noel Ward's presentation *Data-Driven Documents: The Transactional Side,* includes a case study examining the benefits that Variable Data Print had for the Securian Financial Group monthly newsletter and statement. As a large provider of retirement plans Securian needed to communicate to their customers the status of their accounts as well as important information on services and some basic educational information. Using VDP they reduced the number of pages from ten or twelve to four by reorganizing and customizing the sections to the individual customer and including only essential information. This produced a more personalized, action-oriented statement and more useful educational content in the newsletter.

Significance

The meaningful implementation of VDP to the Securian newsletter shows how relevant information can be chosen and arranged such that extraneous content is eliminated. This provides a clearer, simpler, more useful document. This case study is important to this thesis study in that it demonstrates how VDP can add value to a user through the choice of content. It also illustrates how a design template that incorporates a simple, well thought out grid can accommodate varying content types and amounts.





Source

Data-Driven Documents: The Transactional Side, Noel Ward

Precedent D
Bang & Olufsen Music System

Description

In his book *Information Graphics,* Peter Wildbur presents a case study on a music system by Bang & Olufsen that incorporates the idea of progressive disclosure. Beneath the sleek and elegant exterior design is a system that employs selective information presentation to display only relevant options at any given moment. All other options are hidden, eliminating the need for users to mentally remove extraneous options and distractions on their own. *"Bang & Olufsen's Beocenter 9000 is designed on the principle that unless you need to use something, it is not there." (Wildbur)*

Significance

This case study presents an interesting approach to customization information. It aims to make the designs more usable by focusing on the information users need. Many kinds of design solutions (publications, websites, maps) try to meet everyone's needs by including information for all possible scenarios in an attempt to acknowledge all user groups. This approach could be employed in this thesis by removing, hiding, or de-emphasizing unnecessary elements thereby reducing potentially distracting and irrelevant content to a particular user.

A photo of the Bang & Olufsen's music system in which only relevant options are illuminated.

Source
Information Graphics, Peter Wildbur

Introduction

Research for this thesis began with a survey of books and journals relating to the three identified main topics: Variable Data Print, Usability and Graphic Design. Through the information contained in these sources, it was apparent that the initial focus should be on the larger concepts of print customization and user differences. From these broader concepts it was possible to understand the scope of variables involved as well as similarities between examples. For example, considering the larger subject of user differences, as opposed to just usability, offered insight into a wider range of user influences that could be considered. For each topic or source, research is not intended to be a detailed report but a comprehensive summary, that focuses on addressing the aspects that are relevant to print customization and usability.

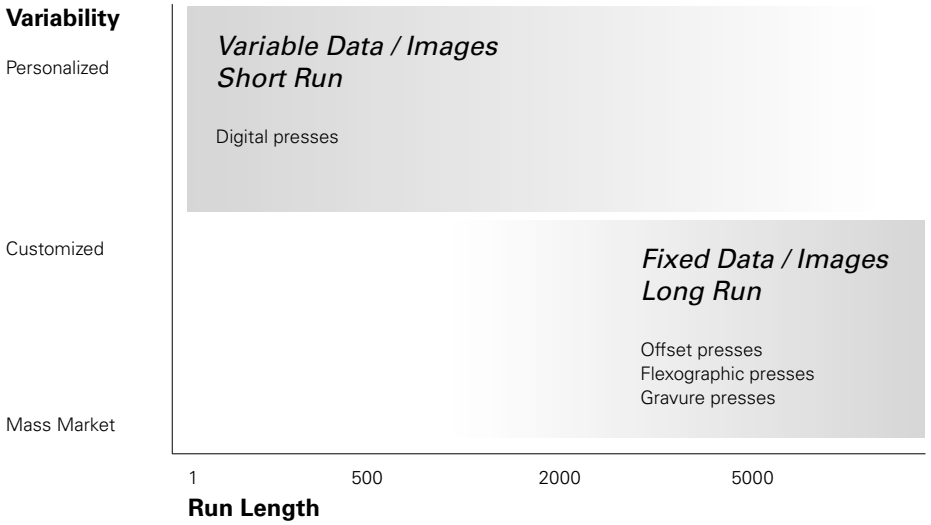
Digital Printing

In *The Very Last Designer's Guide to Digital, On-Demand, and Variable-Data Color Printing,* Frank Romano gives a thorough overview of digital printing that focuses on hardware and technical considerations. He addresses many text issues encountered with variable data, specifically text reflow and text overflow as well as how digital printing relates to offset printing. The table below compares the print run length between traditional offset printers and digital printers in relation to document customization, which Romano divides into mass market, customized, and personalized.

Significance

Aside from pointing out typographic considerations for addressing text reflow and overflow, Romano introduces a few technical points about digital printing that this thesis should take into consideration. These include choosing the appropriate digital printer, paper and fonts. As with any design project, technological and practical constraints play an important part in forming the end result. For this thesis digital printing provides opportunities like variable content and print on demand but imposes constraints on paper selection and design decisions, like the placement or size of text areas, which must account for variable content.

The Affect of Variability on Run Length and Printer Type



Digital Printing (continued)

What are the inherent constraints of print that may impact its customization?

A conversation was held with John Eldridge, the Printing Facilities Coordinator in the School of Print Media at Rochester Institute of Technology. Its focus was to determine the physical and practical limitations involved in digital printing.

Color Conflicts Removed

The first point discussed was the flexibility digital printing offers. In addition to one of the primary benefits digital printing makes possible, the ability to print a single copy as easily as a thousand copies, it also grants more freedom to the designer to use color throughout a document. This is because it does not suffer from the complications of color ink distribution inherent in offset lithography. In digital printing, color can be used anywhere on the page regardless of other elements on the same page or other pages within the same signature. In variable data print consistency of color across multiple copies or versions is a less substantial dilemma, since most users will only see a single version. However, ensuring near identical color on double sided documents and for corporate brand colors still remains important.

Additional Capabilities & Constraints

Other considerations discussed in this conversation were related to bleeding, stapling, scoring, folding and drying time. In regard to bleeding color, a term referring to extending color to the edge of the paper and eliminating margins, John Eldridge said, "as a rule, the C or B level printers (where the highest A level printers are high volume commercial printers and the lowest C level printers are low resolution office copiers) will not print full bleed." Thus, this constraint would have to be addressed by either removing bleeds in the actual document design or performing post-print trimming to eliminate visual margins or edges.

If multiple pages were involved, post-print stapling is a capability that almost all business level digital printers are capable of performing. The ability to fold post-print is also available for B level printers. Scoring is not an operation usually performed in the process of digital printing. It would need to be performed by print operators after the actual printing process with a special scoring device to prevent cracking the toner on digitally printed documents.

Digital Printing (continued)

Digital Printer Selection

After discussion of the constraints of digital printing, it was important to establish the basic thesis application requirements to be used. The requirements established were that the printer be capable of producing the required image quality and be within the price range of a medium sized organization. With these requirements high resolution business level printers were the best choice. This range of digital printers, what John Eldridge calls B+ level printers, are capable of printing high quality 400-600 dpi, color documents for business and commercial purposes. These printers can print on a limited set of coated, smooth surface paper sheets up to 12"x 18" in size. These printers are more affordable to small and medium sized businesses. However, they become even more affordable when leased from the print manufacturer, often with technical assistance and maintenance included.

Significance

The discussion with John Eldridge clarified what typical B level business class digital printers can do. These capabilities and constraints will be taken into consideration when making decisions about size, format and layout for a final application in this thesis study.

B Level Printers

Xerox DocuColor 240

Canon imageRUNNER C2880

Konica Minolta bizhub C250P

Presented are digital printers offered as business solutions by three major digital printer manufacturers. They are all within the B+ range and possess the print quality and capabilities necessary for the purposes of this thesis project's design application.

Variable Data Print

This form of customization, used in digital printing, allows portions of content and imagery to be taken from a database and combined or recombined for various users. With the advent of electronic document creation and digital printing it is possible to develop documents on a one-to-one basis. Using this one-to-one approach means that each solution can have elements unique to an individual, from simply inserting their name to employing detailed statement histories. Currently, this type of customization is being used to help businesses get better response rates from mailings, command more attention from marketing pieces, and generally increase return on investment. Examples from a range of sources are almost exclusively direct mail, marketing, and transactional applications of Variable Data Printing.

Frank Romano, author of *Designing4Digital*, a free monthly online newsletter produced by the Digital Printing Council, often addresses how to effectively create documents for digital printing. Focusing primarily on marketing and direct mailing applications, this resource presents many new and innovative ways, like image manipulation and personalized web tie-ins, in which customization is being integrated to help business objectives.

Significance
As a general model for integrating variable data into print documents, VDP offers many insights into methods and techniques to achieve customization on this one-to-one basis. The widespread use of VDP for direct mailings and transactional documents shows that the technology to integrate variable information and print unique documents is available and developed.

In *Data-Driven Print*, Patricia Sorce and Michael Pletka provide clear categories of print customization:

Types of Print Customization

Versioning	A few versions based on geographical location
Mail Merge	A single document customized with name and address
Personalized Printing	Targeted offers based on recorded purchasing history
Transactional	Billing statements with monthly purchases and totals
Print on Demand	Template-based documents printed as needed
Fully Customized Communications	A unique document based on past and predicted consumer needs

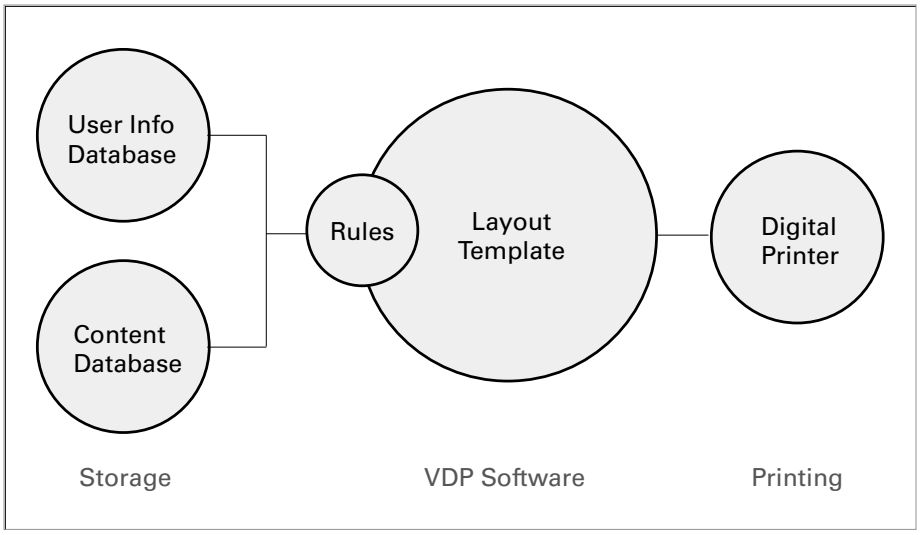
Variable Data Print (continued)

VDP Workflow

There are several aspects of the variable data print workflow that make it different from a typical print workflow. First, in addition to the content and design being based on general user goals, variable data documents are based on information known about an individual. Second, in addition to content and layout decisions made by a designer, variable data rules determine some of the content. Third, while images are normally embedded in a document, variable printing can also store images outside the document and insert them as needed. Fourth, although parts of most variable documents will be fixed, they also contain variable content areas. Finally, printing traditional print documents results in a single version while variable data documents output many unique versions, often reusing shared elements.

The diagram below illustrates the main components of a variable data workflow. User data, text and images are stored in databases outside the design file. VDP software handles both the design and the rules that control what content gets inserted. The VDP software then takes each set of user criteria, inserts text and images according to the rules and exports a file to be printed. This setup is significant because it allows content to be stored and updated separately from the design and allows designs to be customized.

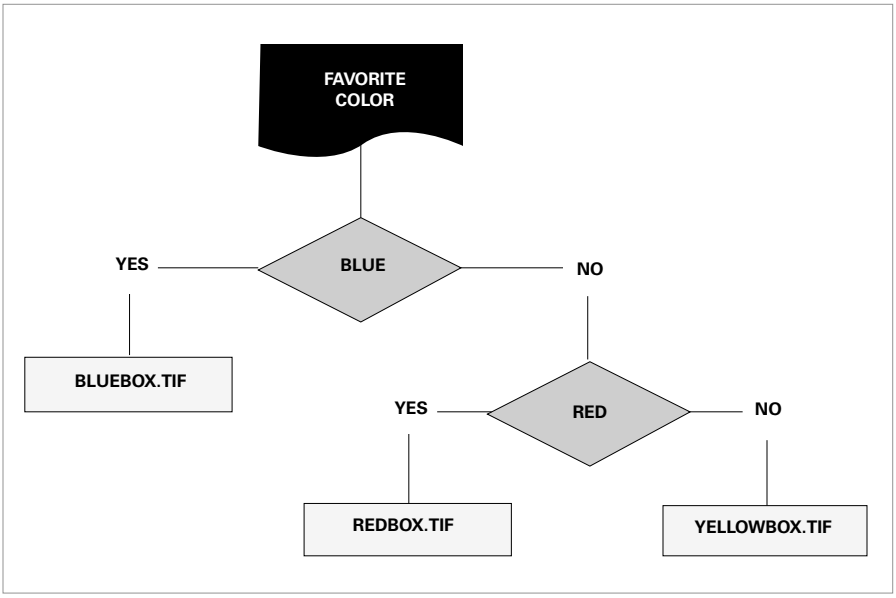
Workflow Diagram



Variable Data Print (continued)

Conditional Logic Statements

Customization decisions in the VDP workflow depend on conditional logic rules. These rules can be conceptually thought of as a sequence of Yes / No questions similar to the process of elimination. When implemented in the VDP workflow, designers can create rules that connect user information from a database to text and image assets thereby controlling how a document is customized. The software then translates these rules into conditional logic statements, implemented in computer programming language as If-Else statements.



The diagram from *Data-Driven Print* by Patricia Sorce and Michael Pletka illustrates how the If-Else decision-making process functions like a flow chart.

Significance

Conditional logic rules can greatly reduce the work involved in designing multiple versions and creates the opportunity for one-to-one customization. A basic knowledge of conditional logic programming is important to this thesis because it fosters the kind of sequential decision-making process a designer needs to consider when creating these customizable documents. This basic overview also makes it clear that the general logic-based language is flexible enough to accommodate any type of information, including user characteristics.

Variable Data Print (continued)

Will the benefits of on-demand VDP be worth the costs?

To understand the current capabilities of VDP software and determine the costs affiliated with employing VDP, Erich Lehman, Prepress Facilities Coordinator in the School of Design at Rochester Institute of Technology was interviewed.

Variable Content Software

Manufacturers and their currently available VDP software:

Atlas Software
PrintShop Mail

Creo Print OnDemand Solutions (PODS)
Darwin VI Authoring Tool

Document Services
xPresso

Em Software
InData

PageFlex
PageFlex Persona Cross Media Suite

Printable Technologies
fusionPro Designer

Saepio
Agilis Marketing Suite

Sansui
xPublisha

XMPie
uDirect

According to Erich Lehman, current VDP software does exist that would make implementation of variable layouts possible. Plug-ins like XMPie uDirect, for industry standard design software like Adobe InDesign, enable designers to add database connectivity and variable text and imagery to their projects. However, to achieve overall page layout variability, cumbersome work arounds and complex database rules would need to be employed and the time involved could quickly outweigh the benefits. Software plug-ins like XMPie uDirect that enable content variability, costing only a few thousand dollars, are much more accessible to small and medium sized organizations.

Variable Layout Software

More powerful software like Pageflex begin to add support for variable layout. PageFlex's Persona Cross Media Suite can customize "the selection of content, the size and position of each and every design element, the appearance and attributes of every design element, the number and size of pages and the delivery method (print, web, e-mail)." (Pageflex, 2007) This Pageflex software can also perform adjustments based on the inserted variable content to "distribute the amount and location of white space on each page, insert additional elements based on the space available, and reduce or eliminate images when there is too much text for the document." (Pageflex, 2007) However, this additional functionality comes at a high price, with a price tag in the tens or hundreds of thousands of dollars. This places this type of software outside the budget of most small and medium sized design firms and companies.

VDP for Consistent Brand Identity

Erich Lehman described a PageFlex case study where variable data print software was being used by car dealerships to customize direct mail while allowing the company headquarters to control brand identity on these printed materials. In this approach the company can design templates and control the possible layouts, images and tag lines. This ensures that the individual dealerships adhere to brand identity guidelines while using their customer database and dealership-specific information to make more relevant customer communications. This use of VDP, in which variable text and images are selected and placed into a limited number of templates, is an approach that could be a useful influence for the design application of this thesis. It offers control over design integrity while still allowing variability of content.

Variable Data Print (continued)

Training and Support Costs
Related to the cost of the software are expenses associated with training designers, software users and support personnel. While plug-ins like XMPie uDirect that integrate into existing software are more easily learned in a few days, more complex software like PageFlex could take months to master. In either case a designer with the appropriate VDP knowledge would be required for the initial design as well as for any updates and technical support down the line.

Turnaround Production
A possible approach to implementing VDP that was discussed involves designing and programming a touch screen kiosk interface that could take the visitor's responses to questions and create and print a customized document, much like a Kodak Picture Maker prints photos with borders and text based on customer's input on a kiosk. Erich Lehman suggested two reasons why this may be difficult. Current VDP software requires the designer to manually connect to a database and export a set of variations in Portable Document Format (PDF). Then, this PDF is also manually submitted to the printer. Therefore, this scenario would require special scripts to be programmed for both the VDP software and computer operating system.

Erich Lehman suggested a more feasible scenario where a potential customer would fill out a form online and either have their customized document mailed to them or pick it up somewhere. The customer's selections could be easily stored in a database and a remote operator could create and print a bundle of customized documents at the end of the day. Although requiring more time this method could be easily be implemented.

Significance
This conversation was beneficial to this thesis in two ways. First, it provided a good overview of the types of VDP software currently available and their capabilities. This allows any decisions about ways to implement VDP in a thesis application to take into account the practical constraints of the software and real world technical concerns. Second, it offered insight in a less hardware focused way, allowing for more understanding of workflow necessities and how VDP solutions fit into a business organization.

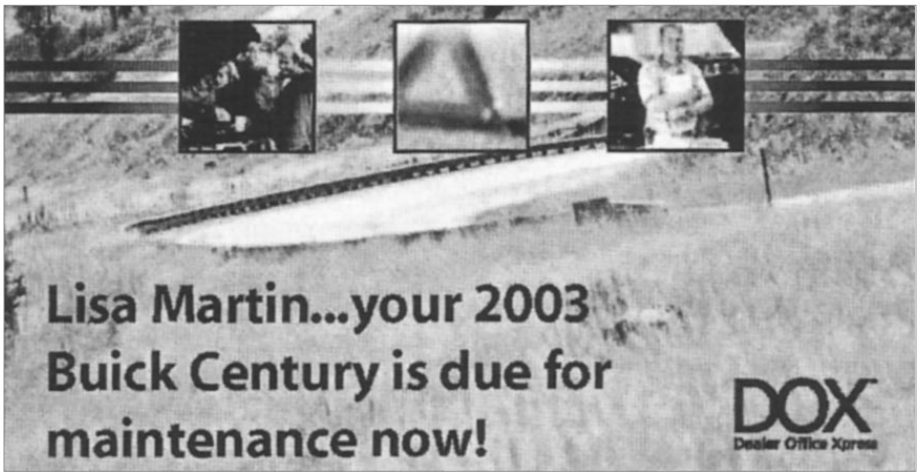
Print Customization

Marketing and Direct Mailing

In their research-based book *Data-Driven Print*, Patricia Sorce and Michael Pletka present data and strategies on how to make VDP a valuable marketing asset in business. They use data-driven print as a more general term to describe printed personalized communication. The many real world data-driven examples examined in this text help illustrate how the information that companies already possess can be implemented through VDP into valuable documents that help acquire, serve and retain customers.

Significance

The ability to customize documents to each user demonstrates VDP's potential to address differences on an individual level. By simply adjusting the content, and thus the message, different outcomes are possible. In the same way, by adding the ability to change design elements, designs can be tailored to convey content in more meaningful and focused ways to specific individuals.



This example, used in *Data Driven Print*, is a typical example of a direct mail piece used in the automotive industry. It takes information known about a customer (name, car purchased, date last serviced) and uses it to create a personalized communication that captures the customer's attention and business.

Print Customization (continued)

Transactional Documents

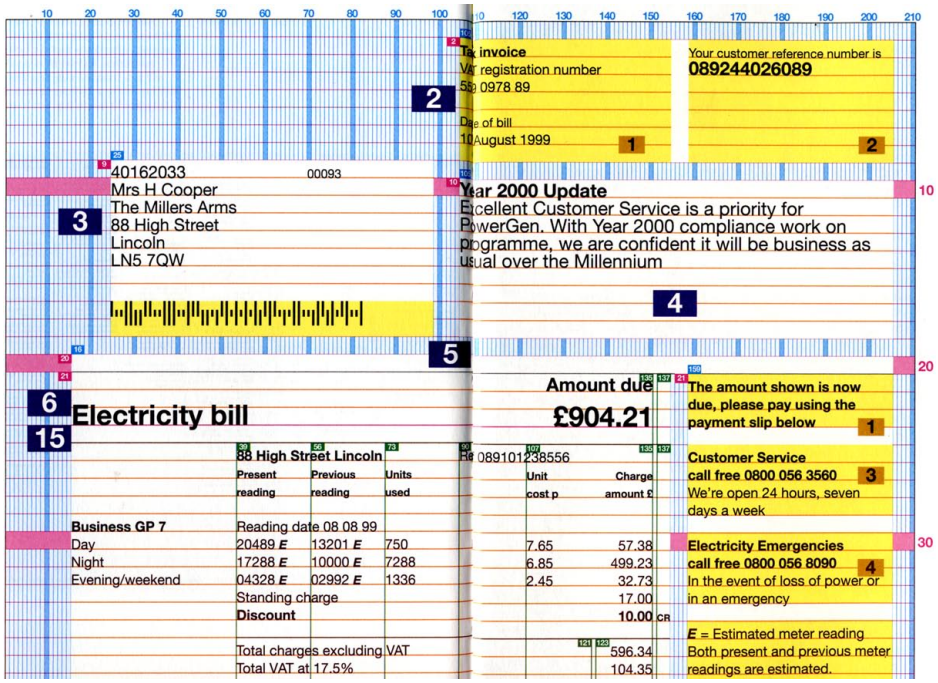
By far the oldest and most common form of VDP documents today are transactional documents. These documents are printed pieces that list transactions or entries from a database, like billing statements or purchase receipts. The purpose behind these documents is usually to present a large amount of data to a user in an organized form that makes it easy for them to understand and refer to.

8vo

One company that has been dealt with transactional documents for quite some time was 8vo. Since 1991, when they worked on the American Express billing statement, 8vo was involved in redesigning transactional documents for credit card, energy, and telecommunication companies. In each case, they not only integrate solid typographic and spatial grid systems, but also address user difficulties related to readability and legibility.

Significance

Although transactional documents often deal with numerical data from a database, they face many of the same challenges as documents with variable text and imagery. Most transactional documents resolve problems related to hierarchy and use of space, as well as the challenge of an uncertain amount of content, by employing grids and clear typographic hierarchy. It is clear that both of these aspects of design will be important to consider when designing a system to accommodate customizable information.



This example of billing statement by *8vo* is a template that specifies distinct content modules and their locations, with a strict adherence to the baseline grid.

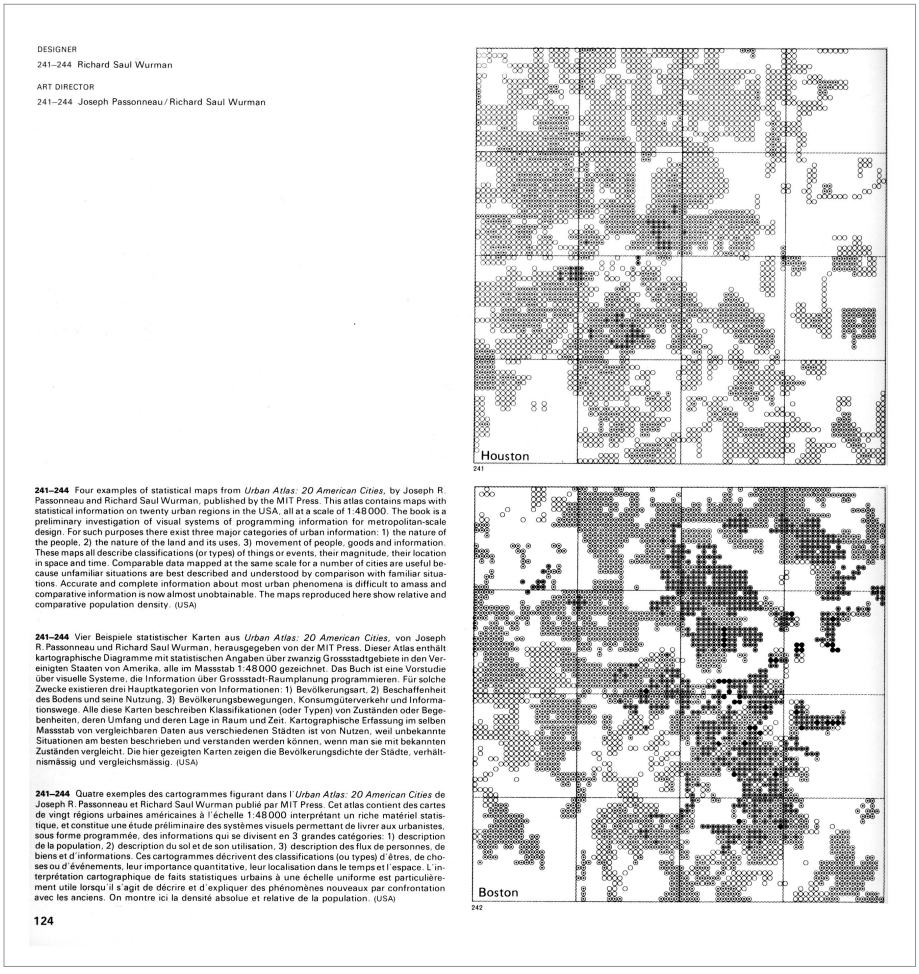
Print Customization (continued)

Multiple Language Translation

In her article *Designing for Translation or Other Variable Data Printing,* Elisabetta Bruno introduces how customization can create cost savings when dealing with multiple language translations. Using VDP allows a single template to be used to substitute each of the different languages as appropriate. She presents the text and layout problems, like text overflow and variable content area overlaps, that can occur and provides some tips for dealing with this application of variable data print.

Significance

In Ellen Lupton's book *Thinking with Type* she states that "Polygot (multilingual) books display a text in several languages simultaneously, demanding complex divisions of the [page layout]." Thus, Bruno's article shows how VDP can address a real design problem. Language translation also addresses a key user difference that could be instrumental in making a document more usable to a large audience. Finally, the article helps expand the definition of variable data print beyond direct marketing.



DESIGNER
241–244 Richard Saul Wurman

ART DIRECTOR
241–244 Joseph Passonneau / Richard Saul Wurman

241–244 Four examples of statistical maps from *Urban Atlas: 20 American Cities,* by Joseph R. Passonneau and Richard Saul Wurman, published by the MIT Press. This atlas contains maps with statistical information on twenty urban regions in the USA, all at a scale of 1:48 000. The book is a preliminary investigation of visual systems of programming information for metropolitan-scale design. For such purposes there exist three major categories of urban information: 1) the nature of the people, 2) the nature of the land and its uses, 3) movement of people, goods and information. These maps all describe classifications (or types) of things or events, their magnitude, their location in space and time. Comparable data mapped at the same scale for a number of cities are useful because unfamiliar situations are best described and understood by comparison with familiar situations. Accurate and complete information about most urban phenomena is difficult to amass and comparative information is now almost unobtainable. The maps reproduced here show relative and comparative population density. (USA)

241–244 Vier Beispiele statistischer Karten aus *Urban Atlas: 20 American Cities,* von Joseph R. Passonneau und Richard Saul Wurman, herausgegeben von der MIT Press. Dieser Atlas enthält kartographische Diagramme mit statistischen Angaben über zwanzig Grossstadtgebiete in den Vereinigten Staaten von Amerika, alle im Massstab 1:48 000 gezeichnet. Das Buch ist eine Vorstudie über visuelle Systeme, die Information über Grossstadt-Raumplanung programmieren. Für solche Zwecke existieren drei Hauptkategorien von Informationen: 1) Bevölkerungsart, 2) Beschaffenheit des Bodens und seine Nutzung, 3) Bevölkerungsbewegungen, Konsumgüterverkehr und Informationswege. Alle diese Karten beschreiben Klassifikationen (oder Typen) von Zuständen oder Begebenheiten, deren Umfang und deren Lage in Raum und Zeit. Kartographische Erfassung im selben Massstab von vergleichbaren Daten aus verschiedenen Städten ist von Nutzen, weil unbekannte Situationen am besten beschrieben und verstanden werden können, wenn man sie mit bekannten Zuständen vergleicht. Die hier gezeigten Karten zeigen die Bevölkerungsdichte der Städte, verhältnismässig und vergleichsmässig. (USA)

241–244 Quatre exemples des cartogrammes figurant dans l'*Urban Atlas: 20 American Cities* de Joseph R. Passonneau et Richard Saul Wurman publié par MIT Press. Cet atlas contient des cartes de vingt régions urbaines américaines à l'échelle 1:48 000 interprétant un riche matériel statistique, et constitue une étude préliminaire des systèmes visuels permettant de livrer aux urbanistes, sous forme programmée, des informations qui se divisent en 3 grandes catégories: 1) description de la population, 2) description du sol et de son utilisation, 3) description des flux de personnes, de biens et d'informations. Ces cartogrammes décrivent des classifications (ou types) d'êtres, de choses ou d'événements, leur importance quantitative, leur localisation dans le temps et l'espace. L'interprétation cartographique de faits statistiques urbains à une échelle uniforme est particulièrement utile lorsqu'il s'agit de décrire et d'expliquer des phénomènes nouveaux par confrontation avec les anciens. On montre ici la densité absolue et relative de la population. (USA)

124

Houston
241

Boston
242

In this example from the book *Graphis Diagrams*, the text is translated into three languages that coexist on every page. The same written information could be displayed using a single column with VDP, thus increasing space for imagery and removing the two unused languages.

Usability

International Standards Organization (ISO)

The International Standards Organization (ISO), well-known for its development of standards for industrial processes and product quality, defines usability as "... the effectiveness, efficiency and satisfaction with which specific users can achieve specified goals in a particular environment." (ISO 9241-11) This standard then further defines each component as follows:

Effectiveness	The accuracy and completeness with which specified users can achieve specified goals in particular environments
Efficiency	The resources expended in relation to the accuracy and completeness of goals achieved
Satisfaction	The comfort and acceptability of the work system to its users and other people affected by its use

Five Dimensions of Usability

In her article *The Five Dimensions of Usability,* Whitney Quesenbery attempts to move beyond the task and performance focused definition provided by ISO, and expands the definition of usability to five aspects that describe the end result the user experience:

Effective	The completeness and accuracy with which users achieve their goals, which range from finding information and completing a task to just having fun.
Efficient	The speed and accuracy with which users can complete their task.
Engaging	The degree to which the tone and style of the product makes it pleasant or satisfying to use.
Error Tolerant	How well the design prevents errors, or helps recovery from those that do occur.
Easy to Learn	How well the product supports both initial orientation and deepening understanding of its capabilities and content.

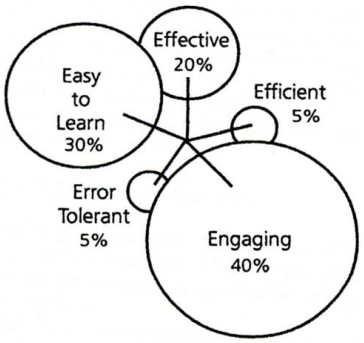
Significance

These definitions are useful to this thesis in that they provide concrete ways to look at, address and evaluate design solutions. Addressing effectiveness involves understanding the user and his or her goals, and customizing the information to reach these goals. Addressing efficiency involves considering user task models and adjusting layout and categorization accordingly. Addressing engagement methods might involve varying the choice of language, mode of interaction or aesthetic decisions in a visual layout. Addressing error tolerance involves anticipating different types of mistakes and misunderstandings based on certain user characteristics and incorporating adjustments accordingly. Finally, addressing the ease of use involves simplifying or providing additional aids depending on a user's background or experience with a topic.

Usability (continued)

Usability Trade-offs

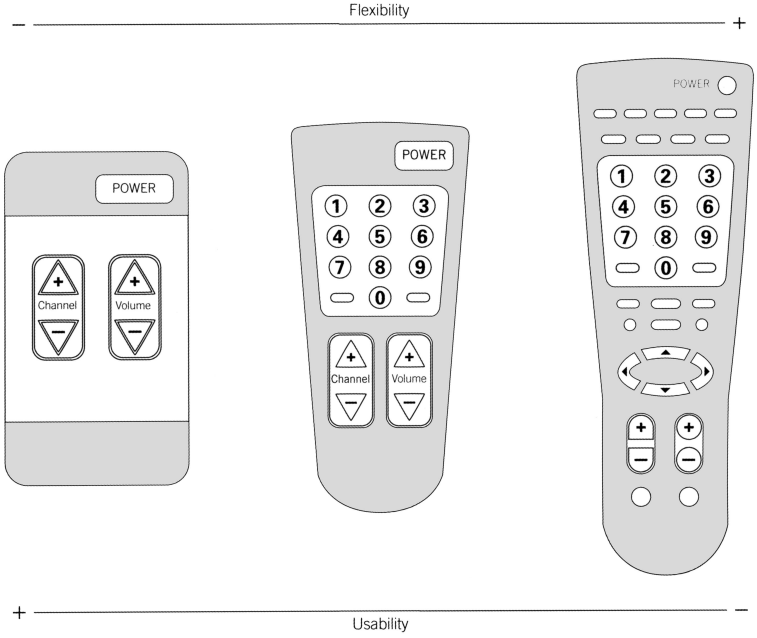
Every design situation has differing priorities and needs that often require trade-offs between which aspects are given the most attention and which aspects will remain less developed. While one design project may have a stronger focus on accuracy and efficiency, another may have more focus on engagement and usefulness. Ideally, a design solution will address all the aspects of usability to some degree.



In her article, *The Five Aspects of Usability,* Whitney Quesenbery introduces a model that illustrates this concept of determining the varying weight and importance of the aspects of usability. She explains that different users have conflicting needs and that these needs vary depending on function, time, and context changes. Another view of the trade-offs involved in addressing usability is presented in Lidwell, Holden and Butler's book, *Universal Principles of Design.* In their example, the trade-off is between flexibility and usability. In this case, as a product is designed to include a wider audience with greater ranges of abilities, skills and needs, the product generally becomes more complicated and the usability of the product declines.

Significance

Considering usability trade-offs will be important to this thesis study. When a final application is chosen, some consideration will need to be placed on which aspects are vital to success and which can suffice with minimal attention. The size and diversity of the audience for any particular product will also influence how much flexibility, or customization, the final design solution should include.



(Above) This example from *Universal Principles of Design* by Lidwell, Holden and Butler demonstrates the trade-off between ease of use and efficiency to added functionality and relevance. By customizing design for the purpose of usability this thesis study aims to achieve the best of both worlds.

(Above Left) This diagram shows the priority put on each of the five dimensions of usability for a specific product. In this case "efficiency and error tolerance will require special attention to ensure that failures in these dimensions do not undercut the overall success." (Quesenbery, 2003)

User Differences

Individual Differences

In Patrick Jordon's book *An Introduction to Usability,* the author presents a scope of usability in which four overall user characteristics affect usability: *experience, domain knowledge, culture and age.*

Experience

Relates to both the specific or related products

Example: User knowledge of the page layout software QuarkXPress would be a factor in how a tutorial for InDesign would be presented.

Domain Knowledge

Refers to knowledge of the task or subject matter

Example: User knowledge of design and layout would be a factor in how a tutorial for InDesign software is constructed.

Culture

Affects how people interact with products; includes standards, conventions, and physical differences

Example: The color red may evoke different associations for people from different countries, from love and celebration to war and mourning.

Age

Impacts interests, physical strength and differing sets of accumulated knowledge

Example: Chairs are often designed for users of differnet ages, such as chairs whose seats are easier to get in and out and children's seats that place them at normal table height.

Significance

Users are a primary focus of this thesis and play an important role in the design process. It is beneficial to include feedback from end users in almost any stage of the product design process from research through implementation. Performing user testing and getting feedback allows improvements based on actual user concerns to be incorporated and eliminates assumptions or stereotypes about users that designers may have. While usability focuses on the ability of users to accomplish tasks, it is also important to understand individual and collective challenges users face in order to anticipate and address their needs. Thus, collecting and determining a wide range of user traits and associated abilities is an important part of this thesis.

User Differences (continued)

Multiple Intelligences

Howard Gardner, a psychologist and professor at Harvard University, has had a substantial influence on education and learning with his theories on human intelligence. In his book *Frames of Mind: The Theory of Multiple Intelligences* he presents a view of human intelligence in which everyone actually possesses several different intellectual strengths.

The eight intellectual tendencies he describes are: Linguistic, Bodily-Kinesthetic, Spatial, Musical, Logical-Mathematical, Intrapersonal, Interpersonal and Naturalist. Each type of intelligence is predisposed to different modes of understanding and learning. For example, someone who has a strong disposition towards spatial intelligence would be sensitive to colors, shapes, symmetry and images. They would be inclined to representing ideas visually, notice visual details and be good at drawing.

One prominent advocate of Howard Gardner's theory of multiple intelligences is Thomas Armstrong who has published several books related to learning and human development. In his book *Multiple Intelligences in the Classroom* he shows how multiple intelligences related to learning and teaching. See Appendix B for examples.

Significance
With the proper understanding of each of these intelligences teachers, or anyone who needs to effectively convey information or concepts, can apply different presentation or teaching methods to ensure that everyone has an equal chance to be engaged. Although addressing multiple intelligences would greatly aid usability it would be difficult to integrate this theory into this thesis since the methods of identifying these intelligences often involves lengthy questionnaires and direct observations.

Learning Styles

Silver, Strong and Perini, in their book *So Each May Learn*, take this idea of multiple intelligences, or the ways people demonstrate intellectual ability, and make connections to three learning styles: *visual, auditory*, and *kinesthetic*. Users who are disposed to a certain type of intelligence will generally be inclined to learn through one of these channels. By cross referencing learning styles with multiple intelligences, the authors demonstrate how each type of intelligence can best be taught in order to produce the most effective transmission of information.

Significance
Learning styles provide a model of users based on how they understand and learn best from different presentation methods. Many of these learning styles also involve methods other than visual, printed materials such as lectures and interactive activities that would be difficult to implement in variable data print documents. However, the approaches used in this theory provides insight into additional design approaches that may be helpful, such as incorporating a strong visual rhythm, changing the style of prose or including self-reflective questions.

User Differences (continued)

Accessibility

Creating solutions that are designed to be usable regardless of a user's visual or physical disability or impairment is the focus of accessibility. Demographic groups included in these types of considerations range from people with low vision to blindness, to situational or emotional impairment, to permanent physical disability as well as any other situation where average sensory or physical abilities do not function within the normal human range of capabilities.

Microsoft's Accessibility website and Paul Arthur, of Public Works Canada, provide informative explanations, conditions and examples of many types of disabilities. The following three excerpts relate strongly to vision and language in design. Additional impairments include *literacy impairment*, which is "descriptive of persons that are functionally illiterate in the language that the message is expressed in" (Arthur, 1988), and *situational impairment,* which includes "persons that are [temporarily] angry, apprehensive, confused or distraught." (Arthur, 1988)

Disabilities and Impairments

Visual Impairments include persons with low vision or poor eyesight, partial eyesight, and sight anomalies such as color deficiency and reduced fields of vision. Most of these impairments create issues of legibility and are often addressed through careful typographic choices. (Arthur, 1988) (Microsoft, 2006)

Learning Impairments include persons with conditions from "dyslexia and attention deficit disorder to retardation." These conditions often create difficulties in processing problems and can interfere with the learning process. "Many individuals with learning difficulties and impairments are perfectly capable of learning if information is presented to them in a form and at a pace that is appropriate to them individually. Reducing visual distractions can also aid the learning process for many people." (Microsoft, 2006)

Language Impairments include persons with "conditions such as aphasia (loss or impairment of the power to use or comprehend words, often as a result of brain damage), delayed speech (a symptom of cognitive impairment), and other conditions resulting in difficulties remembering, solving problems, or perceiving sensory information. For people who have these difficulties and impairments, complex or inconsistent visual displays or word choices can make [tasks] more difficult." (Microsoft, 2006)

Significance

Understanding the difficulties and challenges people face when using printed matter is vital to addressing their needs. By drawing on the extensive research and proven results from large corporations and advocacy organizations, addressing these users becomes a matter of identifying the challenges and implementing the corresponding design adjustments. However, usability goes beyond simply making design accessible, it makes it effective, efficient, easy to learn, error tolerant, and engaging. The hurdle of making it accessible is simply the first step in making customized design usable at the individual level.

Universal Design

When accessibility is expanded to making design usable by as many people as possible, it is called universal, inclusive, or barrier-free design. Lidwell, Holden and Butler describe this approach as one in which "designs should be usable by people of diverse abilities, without special adaptation or modification." In their book, *Universal Principles of Design*, they describe four characteristics of universal design.

Perceptibility	Everyone can perceive the design, regardless of sensory abilities
Operability	Everyone can use the design, regardless of physical abilities
Simplicity	Everyone can easily understand and use the design, regardless of experience, literacy, or concentration level
Forgiveness	Everyone can easily avoid and minimize consequences of errors

The Center for Universal Design at the North Carolina State University also produced a set of principles that describe the aspects of Universal Design. These principles share the consideration of the user, however are more focused on ensuring that design is equally easy to use and accommodating to everyone regardless of any user differences or abilities.

Equitable	Does not disadvantage, stigmatize or privilege any users.
Flexible	Accommodates a wide range of individual user preferences and varying functional abilities.
Intuitive	Is easy to understand regardless of the user's experience, knowledge, language skills or concentration level.
Perceptible	Communicates all necessary information to all users regardless of ambient conditions or the user's abilities.
Safe	Minimizes hazards and adverse consequences of accidental or unintended actions.
Easy	Can be used efficiently, comfortably and with minimal fatigue.
Accommodating	Provides appropriate size and space for approach and use regardless of body size, posture, or functional abilities.

Significance

At first, this approach of designing a single universal solution may seem at odds with producing many customized print documents. However, they shared the underlying goal of reaching the widest possible audience and meeting everyone's needs. Aside from addressing issues of physical and cognitive abilities, this approach to design touches upon many other important user differences that this thesis hopes to address, like previous experience and knowledge, culture and language, and situational variables. This thesis shares the goal of making design equally usable for everyone.

Typography

Rolf Rehe's book, *Typography: How to Make it Most Legible,* is a collection and analysis of research that offers many insights into typographic design. The research focuses primarily on reading speed and comprehension and "finding the typographic arrangements best facilitating these factors, [as well as] finding such typographic variables which please the eye [and achieve] reader attention and response." (Rehe, 12)

For several aspects of typography, Rehe offers recommendations:

Typeface	Avoid all caps, use large lowercase type or bold
Type Size	Between 8 - 12 points depending on typeface
Leading or Line Spacing	For 10 point type, use leading of 1 - 4 points
Line Length	Typically 10 - 12 words per line or 80 mm
Typographic Arrangement	Use unjustified, possibly aids legibility
Color and Contrast	Black type on white or cream background

In addition, Rehe mentions that left aligned paragraph text creates a more contemporary, relaxed typographic style and old style and Arabic numerals are more legible than Roman. He stresses that "type size, line width, and leading should always be considered together since these variables greatly inter-relate." (Rehe, 21)

Reading and Comprehension Speed

Throughout the book Rehe explains how each variable either helps or hinders reading speed, cognition and visual time spent comprehending text. For example, he found that "smaller type sizes simply reduce visibility of the type and hamper the all important word recognition" and "larger sizes force readers to perceive words in sections, rather than as a whole, and consequently slow down reading speed." (Rehe, 28)

Learning Materials

For addressing learning and tables, Rehe offers some specific suggestions. "When learning is the major concern, diagrammatic presentation should be used, and, when reader preference is taken into consideration, tabular presentation should be selected. Tables should be set in at least 8 point type, with generous leading. The material should be broken into vertical groups of five, with the first column in bold face, and at least one pica space and/or rule between the columns. Tables should not be too long and not be crowded by too many columns." (Rehe, 44)

Significance

Rehe's research-based approach to making typographic decisions is actually quite user-centered and lends itself well to this thesis. Although many of the suggestions provide one final solution, many others like his advice on type size and reading comprehension illustrate how to adjust the typographic variable for different objectives. Rehe's collection of research is important to this thesis because it provides some concrete ways to adjust type for various users and purposes.

Typography (continued)

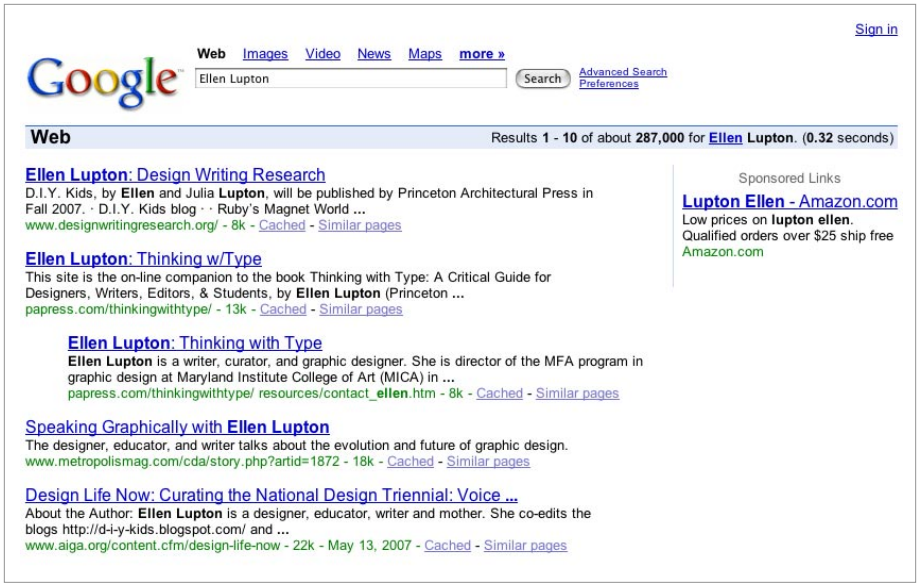
Typographic Hierarchy

In her book, *Thinking with Type,* Ellen Lupton presents contemporary typography as having "borrowed not from literary criticism but from human-computer interaction (HCI) studies and the fields of interface and usability design. The dominant subject of our age has become neither reader nor writer but user, a figure conceived as a bundle of needs and impairments - cognitive, physical, emotional." (Lupton, 73)

From this user-centered frame of mind, Lupton proceeds to explain the importance of typographic hierarchy to the user. She explains that a typographic hierarchy is both an organizing system for content and a method to emphasize or diminish information importance. It helps a reader "scan a text and pick and choose among its offerings." (Lupton, 94)

A typographic hierarchy is composed of levels that are "signaled by one or more cues, applied consistently across a body of text." These cues can take many forms from indentation, line spacing and page placement to the size, style or color of the typeface. "Infinite variations are possible." (Lupton, 94)

An example that illustrates the power and flexibility of a well devised typographic hierarchy are Internet search engines. When the results of a search are listed on the webpage, typographic style sheets differentiate the parts through the use of color, size, weight or underlining (Lupton, 99). These typographic styles establish a hierarchy that makes the job of sifting through the results easier.



Significance

It is clear that by employing typography and typographic hierarchy, the effort placed on the user to differentiate and prioritize information can be greatly reduced. What makes set typographic styles even more relevant to this thesis are their ability to be implemented on variable data, like search engine results.

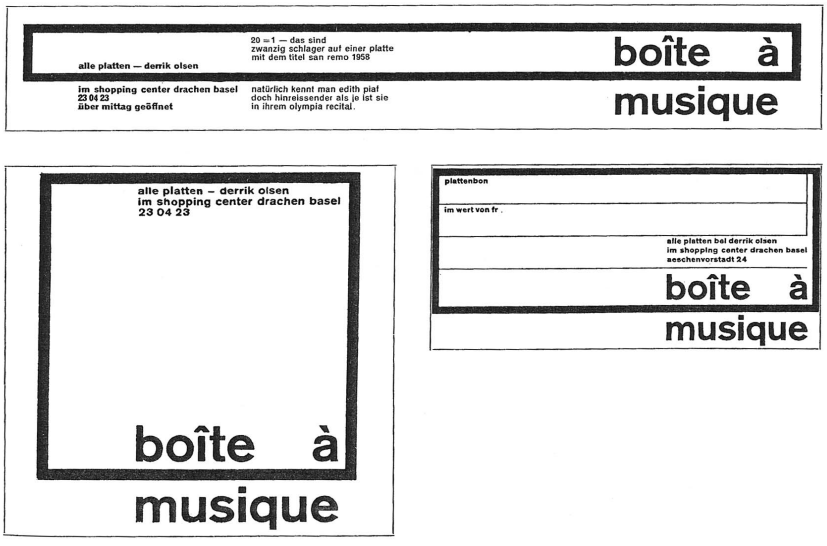
Grids / Visual Organization

How will graphic design accommodate this customizing while maintaining its integrity?

Ellen Lupton's *Thinking with Type* also offers substantial insights into the use of grids and their ability to structure collections of data and text. Among the aspects of the grid covered are columns and zones. Lupton suggests that multi-column grids "provide flexible formats for publications that have a complex hierarchy or that integrate text and illustrations" and that "the more columns you create, the more flexible your grid becomes." The grid can also be used to "articulate the hierarchy by creating zones for different kinds of content." (Lupton, 142) In this way the clarity and consistency of content placement makes finding information easier.

"Designing in response to the internal pressures of content (text, image, data) and the outer edge or frame (page, screen, window), an effective grid is not a rigid formula but a flexible and resilient structure, a skeleton that moves in concert with the muscular mass of information." (Lupton, 112)

The grid offers a strong yet flexible way to not only structure and organize information but to unify sets of pages with varying content. Grids establish rules and constraints on graphic variables that ensure consistency among the set of possible layouts. However, in his book *Designing Programmes*, Karl Gerstner brings up the point that although the typographic grid facilitates consistency within a design the real challenge in employing the grid is finding the right balance between the greatest possible variability and constant elements. (Gerstner, 57)



This example from Karl Gerstner's book *Designing Programmes* shows how a set of rules and underlying unit grid can be used to create designs that are flexible to varying sizes and formats.

Significance

When Ellen Lupton describes the role of the grid as one of "unifying sets of pages with varying content" (Lupton, 110) she could very well be talking about variable data print. Karl Gerstner also suggests that grids are useful in working with variability. Thus, it is clear that grids will be vital to the final thesis application to not only structure and organize variable text and images but also to help maintain a strong visual identity across each version.

Systems Design

A systems approach to design means that considerations of relationships, similarities and connections between the components of individual layouts of a design series are carefully attended to. These components can relate to any aspects related to design from color, typography and imagery to spatial, language and concept considerations. In addition to providing consistency, systems design creates a unity among all the individual pieces which serves to strengthen the series as a whole. It allows each additional piece to provide more depth and meaning to the rest.

This series of book covers from the book *Making and Breaking the Grid* by Timothy Samara shows how a set of book covers for the gospels of the Bible employ spatial, imagery and typographic systems considerations. An imagery system uses only duotone photographic images. A typography system is used to consistently differentiate title, subtitle and authors. A spatial system is used for the placement of text elements and focal points in the imagery.

Significance

Systems design will play an important role not only in visually uniting the varying versions of the application for this thesis but ensuring a consistent level of quality in the varying content as well. Spatial and typographic systems will be important to coordinate the varying layout and text adjustments. Also, language systems will help ensure variables such as content depth and sentence complexity will remain compatible with other design components.

Matrix A

Customization Examples with Usability Analysis

Purpose

Will customized documents make information more accessible and/or usable to individuals?

Criteria

To address this key question examples of customization were collected, including examples outside of print customization. This wide range of examples, from maps and clothing to postcards and magazines, allowed for greater insight into customization in the broadest sense. These examples were then evaluated on five key aspects of usability and the impact customization played in making the product easier to use.

Five key aspects of usability were devised based on Quesenbury's five dimensions of usability and the ISO usability definitions covered in the research section. (See page 20)

Usefulness The degree to which the design helps users achieve their goals. (Value, Relevance, Helpfulness, Completeness)

Efficiency The degree to which the design facilitates speed and accuracy. (Consistency, Visibility, Automation)

Satisfaction The degree to which the design makes users feel comfortable. (Attractiveness, Likability, Credibility)

Forgiveness The degree to which the design prevents errors and helps recovery from those that do occur. (Validation, Feedback, Reversibility)

Learnability The degree to which the design supports both initial orientation and deepening understanding of capabilities and content. (Intuitiveness, Predictability, Flexibility)

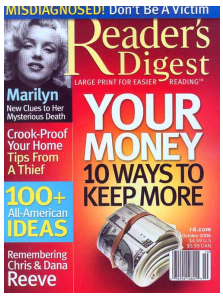
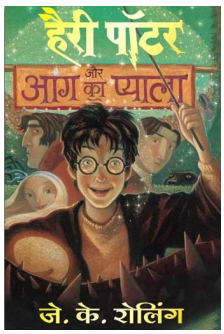
Significance

Evaluating customized products according to these five criteria offered insight into which aspects of usability are primarily being addressed. It became apparent that certain types of information and products used customization in more productive ways. These were the cases where customization was used to make the user's task easier to perform. Examples like large text versions and multiple language books use versions to present information in alternate formats and focused on adding usefulness and efficiency.

In cases where the focus of customization was more for the company's sake, usability aspects were more focused on creating relevancy to the customer (usefulness) and their needs (satisfaction). These included cases like postcard promotions and magazine covers where personal information such as the customer's first name, address or previous purchase was the focus of customization. They were generally less successful because the degree to which they made the product more usable to the user was relatively low.

See matrices on pages 36 - 38 for examples of customization usability analysis.

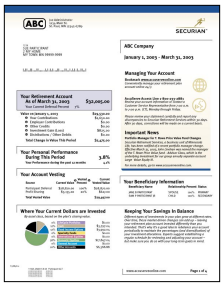
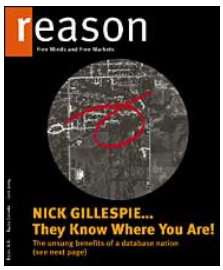
Matrix A
Customization Examples with Usability Analysis

	Description	**Usefulness** Value and completeness	**Efficiency** Speed and accuracy	**Satisfaction** Likability and comfort	**Forgiveness** Error prevention and recovery	**Learnability** Intuitiveness and orientation
Satisfy Unique Needs						
	**Reader's Digest** Same format and content but with larger print.					
	**Mapquest.com** Highlighted routes					
	**Harry Potter** Translated book					
	**Dell Computers** Hardware is mixed and matched online as desired					

Customization helped

- Tremendously
- Substantially
- Somewhat
- Not at all

Matrix A
Customization Examples with Usability Analysis

	Description	**Usefulness** Value and completeness	**Efficiency** Speed and accuracy	**Satisfaction** Likability and comfort	**Forgiveness** Error prevention and recovery	**Learnability** Intuitiveness and orientation
Provide Information						
	**Hospital Signage** Directional wayfinding signage that is unique to individual spaces in a building	●	●	•	●	•
	**Financial Statement** Numbers, graphs, news and advice are unique to each customer's account	●	●	•	•	•
Sell Products						
	**VDP Postcard** Name and address, coupon amount and code, and photo are all customized based on customer profile	●	•	●	•	•
	**Reason Magazine** Personalized cover with aerial photo of subscriber's home	•	•	●	•	●

Customization helped

- ● Tremendously
- ● Substantially
- ● Somewhat
- • Not at all

Matrix A
Customization Examples with Usability Analysis

	Description	**Usefulness** Value and completeness	**Efficiency** Speed and accuracy	**Satisfaction** Likability and comfort	**Forgiveness** Error prevention and recovery	**Learnability** Intuitiveness and orientation
Personalize Products						
	**Music Song** Limited number of preselected names replaced in the song's lyrics					
	**Vanity Plates** Vehicle license plate characters are chosen as desired					

Customization helped

- Tremendously
- Substantially
- Somewhat
- Not at all

Matrix B

Customization Objectives vs. Degree of Customization

Purpose

What levels of customization will be appropriate in addressing user differences?

Criteria

To explore the relationship between the degree of customization and the impact of the customization, this matrix plots customization objectives against the number of possible unique outcomes. This matrix uses the examples from Matrix A and cross references the degree and purpose of customization in each.

Significance

This matrix provides a comparative view of customization examples in order to assess what an appropriate balance of objectives to amount of customization might be. By placing customization examples in this arrangement it is possible to see patterns in the goals of products with similar degrees of customization. This matrix also sheds light on the relationships between the degree of customization and types of information customized.

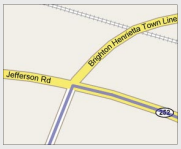
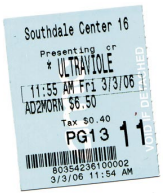
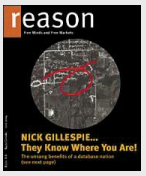
In the top left corner of Matrix B the products all achieve relatively useful objectives with only a few variations, such as books with several language versions or computer system customization with a limited set of choices. In the bottom right corner, the high degree of customization of the products provides relatively little actual benefit to the user. Examples include T-shirts with custom designs printed on them and magazines with personalized text and images meant simply to attract attention.

See matrix on page 40.

Matrix B
Customization Objectives vs. Degree of Customization

Number of Possible Customized Outcomes

One — Infinite

Purpose of Customization	< 10	< 100	< 1,000	< 10,000	< 1,000,000	< 10,000,000
Satisfy Unique Needs	  					
Provide Information	 					
Sell Products						 
Personalize Products						

Example Descriptions

Satisfy Unique Needs	Harry Potter book translations, Dell custom computers, Levi's custom fit jeans
Provide Information	Site specific wayfinding signage, merchandise labels, customized newsletter content
Sell Products	Personalized car dealership postcard, Reason Magazine personalized cover
Personalize Products	Jessica Simpson music with name substitutions, vanity license plate, custom graphics t-shirt

Matrix C
Design Strategies Related to User Difficulties

Purpose

Do people read documents differently? If so, what factors are influential?

Can differences in thinking and learning styles be mediated through customized design solutions?

Criteria

To address the many different factors that influence how a product or design is used, a compilation and organization of user differences was created. Based on research sources and feedback from thesis advisors, three main sections were devised. These sections were intended to encompass the wide range of influences on usability:

Inherent Inherited or developed physical and cognitive traits	**Visual Impairments** Low Vision, Color Blindness **Learning Disabilities** ADD, Dyslexia **Cognitive Abilities** Memory, Perception, Attention Span
Learned Acquired or conditioned language or social tendencies	**Education** Vocabulary, Reading Level, Literacy **Culture** Standards, Values, Schema **Language** Conventions, Translation
Situational Circumstantial or imposed task and environmental factors	**Task** Goal, Time, Past Experience **Environment** Lighting, Distance, Materials **Emotions** Attitude, Expectations

Significance

Within these broad sections in the matrices on the following pages are lists of both specific and general differences that users face or may be influenced by. Adjacent to each of these specific differences are associated aspects that may cause difficulty. Finally, the last column lists possible design strategies, obtained from research, to address the specific difficulties users may face related to inherent, learned, or situational differences.

The matrices on the following pages brings together a wide range of user differences and provides several benefits. First, it organizes them in a way that makes connections not only between similar user difficulties but shared design approaches. Secondly, this matrix provides a quick reference when making design decisions for variably customized documents.

See matrices on pages 42 - 43.

Matrix C
Design Strategies Related to User Difficulties

		Possible Difficulties	Design Strategies
Inherent Differences			
Learning	**Impairments**		
	ADD	need to learn by doing	pace, repetition
	Dyslexia	difficulty processing info	multiple presentation modes reduce visual distractions
Visual	**Impairments**		
	Low vision	legibility	type/background contrast
	Red/Green Color blindness		color value choice/contrast
	Age-associated Astigmatism	reading small print	type size, typeface choice
Cognitive	**Impairments**		
	Short-Term Memory	trouble remembering and solving problems	grouping, memory aids consistency, word choices redundant coding methods simplification
	Perception	difficult to focus on elements	easily separated elements
		distinguishability	foreground/background
		inability to discern details with distracting elements	remove unnecessary clutter
		selective attention	zone information
		comprehension	meaningful structure
	Attention Span	limited time to get info	reduce amount info focus attention zone information

Matrix C
Design Strategies Related to User Difficulties

		Possible Difficulties	Design Strategies
Learned Differences			
Education	Vocabulary	comprehension	sentence complexity
	Reading Level		grouping / clustering
	Literacy		word choice
Culture	Conventions Standards	miscommunication	visual vs. written
	Values	offensive text/images	alternate text/graphics
	Schema / Mental Models	different understandings	organize info differently meaningful names/icons use familiar metaphors
Language	Second Language	comprehension reading conventions	information zoning visual vs. written
	Translation	readability	interchangeable modules
Situational Differences			
Task	Content / Domain Experience	previous knowledge	complexity of information amount of detail
		interest	strategies to engage user
	Goal	different design needs	information organization
		learning vs. reference	information choice
		entertainment vs. work	
	Time	limited timeframe	informative headings content organization progressive disclosure promote pape scanning
Environment	Lighting	poor / low	higher contrast larger type less condensed layout
	Distance	close / far	
	Attention	divided / multi-tasking	focal points / emphasis ample negative space typographic rules clear hierarchy pattern / rhythm
User (Affect)	Attitude	low motivation	simpler approach relate to interests more depth / complexity
	Expectations		
	Emotional State		

Matrix D
Semantic Operations

Purpose

The first part of the matrix on the following page looks at the elements, principles, and methods that graphic design employs and their relationship to semantic operations. Do certain graphic elements and principles lend themselves to certain operations? Which ones can be changed in multiple ways?

The second part of this matrix explores the ways in which various difficulties faced by innate, learned, and situational user differences can be changed at the most basic level. Could these user difficulties be addressed through the use of semantic operations by adding, subtracting, adjusting, substituting, or exchanging elements on a page?

Criteria

Each user and graphic design consideration is categorized into one of the five basic operations that can be performed upon them. These operations are:

Subtraction	Taking something away
Addition	Adding something new
Adjustment	Changing an existing element
Substitution	Taking something away and replacing it with something new
Exchange	Changing positions between existing elements

Significance

Looking at graphic design elements, principles, and methods and how they relate to the semantic operations helps establish the ways in which they can be customized. Correlating this knowledge helps identify the shared operations between the two. By identifying the shared methods in which both of these topics can be changed, the appropriate graphic design approaches can be selected for specific user needs.

See matrices on pages 45 - 46.

Matrix D
Semantic Operations - Graphic Design Considerations

	Elements	Principles	Methods
Subtraction taking something away	Negative Space		
Addition adding something new		Emphasis	Redundant Coding
		Focal Point	
	Typographic Rules	Repetition	
Adjustment changing an existing element	Type Size & Weight		
	Typeface	Similarity	
	Colors	Scale	
	Value / Density	Contrast	Hierarchy
Substitution taking something away and replacing it with something new			Clustering
			Modules
			Information Zoning
			Written vs. Visual Explanations
Exchange changing positions between existing elements		Pattern & Rhythm	
	Columns	Sequence	Grouping or Clustering
	Flowlines	Continuation, Alignment	
	Figure & Ground	Proximity	

Matrix D
Semantic Operations - User Differences

	Inherent	Learned	Situational
Subtraction taking something away Example *Removing elements simplifies and unclutters the page so less attention is required.*	Attention Span Limits of Short Term Memory Cognitive Processing Difficulties	 Readability	Divided Attention Low Motivation
Addition adding something new Example *Adding elements, like color or lines, can help point out important information.*	Attention Span Limits of Short Term Memory		Divided Attention
Adjustment changing an existing element Example *Changing a property of an element, like size or tone, can make it easier to read.*	Color Blindness Legibility	 Misinterpretation	Divided Attention Legibility
Substitution taking something away and replacing it with something new Example *Replacing text with a simpler language alternate can make it easier to understand.*	 Cognitive Processing Difficulties	Comprehension Readability Misinterpretation	 Low Motivation
Exchange changing positions between existing elements Example *Using a language's conventional date and time formatting promotes familiarity and helps avoid misinterpretation.*		Cultural Conventions Language Difference	

Print Customization Criteria and Applications

Purpose

Which types of print materials would be viable and useful in a customized format?

Criteria

Introducing variability and a usability focus to print documents offers many advantages, but also includes constraints. In order to make variable print documents focused on usability viable (cost and time effective) and useful (providing additional benefits, certain basic criteria must be met. Based upon practical considerations, the following criteria were determined to help select appropriate formats:

Print Artifact	The final application must relate to print since Variable Data Print involves customizing print.
Large, Diverse Audience	Productive customization requires a substantial number and an appropriately diverse range of users.
Task-Oriented	Usability considerations focus primarily on user tasks and how design solutions help or hinder users in achieving their objectives.

Applications

Using the above criteria and examples from research the following lists of possible application locations, content and formats were assembled:

Locations	**Types of Information**	**Formats**
Government	Educational	Forms
Museums	Informational	Guides
Parks	Directions	Maps / Directions
Transportation	Reference	Product Instructions
Schools	Instructions	Information Brochure

Introduction

With research collected and analysis performed on the relationships between variable data print, usability and graphic design, the beginnings of design application could be established. Working from the initial criteria and directions explored in the final synthesis question, an appropriate application was established. Next, ideation moved into conceptualization including identifying scenarios and exploring ways to variably adjust documents with layout and design variables. Finally, all of the research, synthesis and conceptualization were combined and developed into a prototype design which was refined over several versions.

Below is an outline of the major pages within this section.

Potential Direction 1

Customs Declaration Form

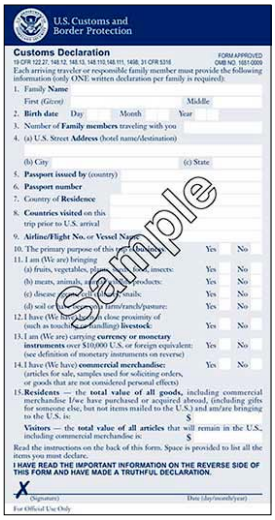
Summary

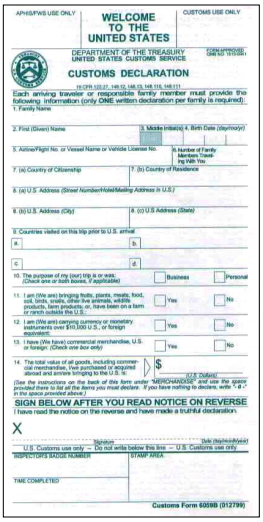
Redesigning the U.S. Customs Declaration form as a variable data document would allow different methods of organizing and presenting questions to be used. Questions and data obtained would remain intact but the task of the traveler, filling out the form, would be easier and clearer. Applying VDP would involve setting up a basic grid or module framework upon which changes to layout, communication approach (simple labels, explanatory text, or imagery), and typographic variables could be adjusted.

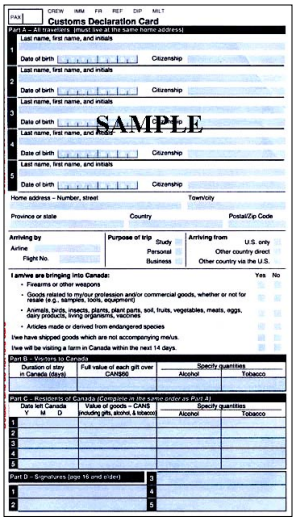
Thesis Content

This application addresses many user differences including: visual abilities, cognitive abilities, language comprehension, multiple languages, and cultural conventions. Designs for this form would customize typographic variables like type size and weight, text/background contrast, spoken language and language complexity, levels of and choices of imagery used, amount of text in instructions/labels/descriptions, and order and arrangement of elements. To facilitate these customizations it is clear a strong, modular grid would need to be employed to help strengthen the variable spatial system.

Additional considerations that need to be addressed include how, when, and what information can and should be collected and how customization decisions influence each other and interact in the final design.







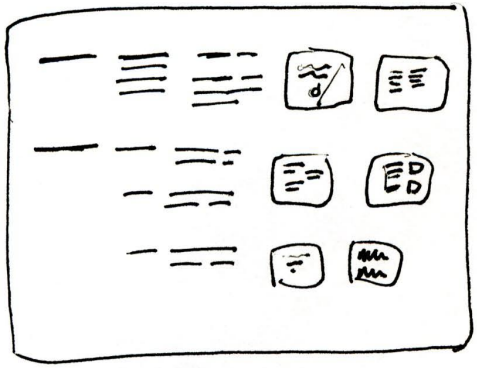
These examples of the current and previous United States Customs Declaration forms (left, center) and a previous Canadian Declaration Card (right) illustrate the content density and design approaches used for these types of documents.

Potential Direction 2
VDP / Usability Planning Guide

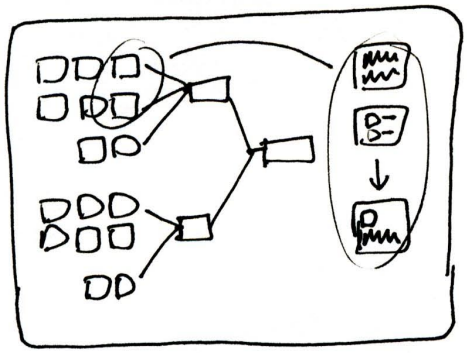
Summary

This direction would be a short guide in the form of a pamphlet which would take the research and synthesis thesis content and present the concepts involved in designing for usability using VDP. This application would incorporate a large amount of thesis content including user differences and elements of graphic design that are most meaningful to print customization.

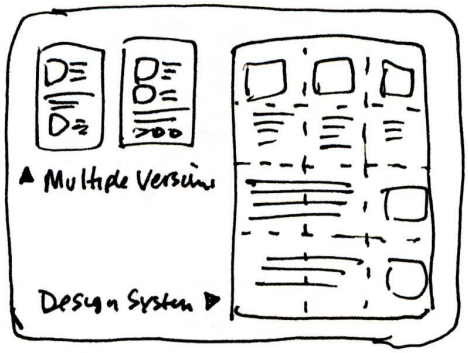
The planning guide would include three sections. Section One would have meaningful groupings of user differences / usability concerns and common impediments. It would be similar to the Matrix C: Design Strategies Related to User Difficulties presented in the Synthesis section. (See matrices on pages 42-43.) Alongside this table would be illustrative examples of the difficulties and potential graphic design solutions. Section Two would be explanations of the variable data technology and design systems involved in combining multiple individual design adjustments into one final design solution. Section Three would contain existing case studies with potential VDP solutions to show how the concepts could be applied to real world situations.



Section One
Grouped user difficulties with potential design solutions and illustrative examples.



Section Two
Overview of the variable data decision model and design systems for variable elements.



Section Three
Case studies with examples of potential VDP design solutions.

Potential Direction 3
Museum Tour Guide

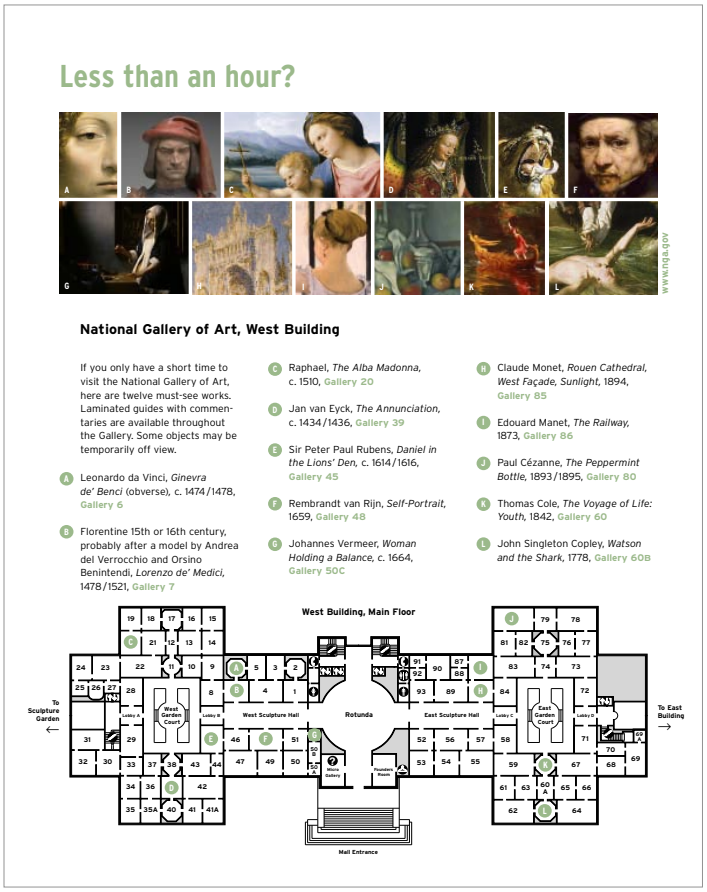
Summary

As both wayfinding and educational tools, museum (and other public building) guides have the potential to address the different ways people interpret, assimilate and use information. These guides, which are often used by many people of different backgrounds, must include a wide variety of content depth, choice, and presentation. A variable museum guide would not only allow text adjustments and content changes but enable building maps to be customized to the user's specific goal.

Thesis Content

This application addresses user differences in visual abilities, spatial perception, attention and short term memory, language comprehension, multiple languages, and learning styles. It would also include considerations of environmental lighting, user interests and purpose (educational research vs. casual visit). Solutions for this guide would customize typographic variables like type size and weight, text/background contrast, written language and language complexity, choice of imagery used, amount of text in labels/descriptions, memory aides, and arrangement of elements.

A design system to customize tour guide elements with the above considerations would require an underlying grid that is flexible enough to allow for different layouts with varying relationships between informational and wayfinding elements.



This example guide from the *The National Gallery of Art* shows how a museum guide can be customized to users with specific goals, in this case someone with limited time.

Selected Direction
Museum Guides

Based upon the initial discussion of tour guides with thesis committee members, the decision to proceed with museum guides as an application format was agreed upon. In regard to addressing the criteria set in the Synthesis section (see page 47), this location and format satisfied all three constraints (print artifact, large, diverse audience and task-oriented) and included all the types of information listed on that page (educational, informational, directions and reference).

Printed Materials

Although museum guides are often in the form of either actual people, or docents, leading tours or informational audio devices, printed guides are always available for self-guided tours and are, unfortunately, often under developed. These printed guides are often either simple map guides or, on the other end of the spectrum, dense informational booklets. Thus, an opportunity to make printed self-guides more usable was identified.

Large, Diverse Audience

One of the roles museums play is that of a recreational destination and many attract a substantial number of visitors each year. As a handout used by most visitors, museum guides have large circulations, from a few hundred to several thousand copies each day. This substantial museum audience meets the minimum requirement for designing and implementing variably printed museum guides (as described on page 47) as well as making them cost effective.

Most museums are public and open to everyone and so attract a wide range of visitors. This means that anyone from children, families, seniors, students, researchers or tourists can and will visit museums. Depending on the location and type of museum an audience such as this is often culturally diverse, with many different languages, customs and backgrounds. The diversity of age, education and culture lends itself well to the variability and user-centered focus of this thesis.

Task-Oriented

Museum self-guides have a clear purpose: to help visitors move through and explore a museum. As mentioned above, museums also have a wide array of users with different abilities, as well as different motives for visiting. Some visits may be casual and others educationally-focused. Some visitors may want to see the whole museum, while others just want to see a certain aspect or section of the museum. It is easy to see how museum self-guides often need to perform many tasks. Customization is a solution that lends itself to addressing each these tasks on an individual level. It allows just the information each visitor needs or wants to be shown and can make allow this information to be presented in the best possible way.

Types of Guides

With new, variably printed museum guides as an application direction, some additional analysis of existing museum guide examples was performed. (See Appendix C for an excerpt examples collected.) From this external audit of museum guides it was determined that several types of guides exist, including audio guides, docent lead tours, simple map guides, and self-tour guides. Each of these types of guides provides various amounts of information in different ways. Interestingly, docent led tours provide the greatest customization to the visitor. Docents can adjust their tone, topics and pace depending on the group they are leading.

Through the collection and analysis of museum guides it was clear that a printed self-guide was the appropriate format. The ability of a docent to adjust their tour to the specific needs of a group demonstrated the need and ability of musuem information to be customized. The various formats of self directed guides, such as brief or dense histories or backgrounds, map-based, or for specific routes showed that printed guides still had merit and range in the materials they could present. It was evident that combining these two world of docent and printed guides could address differing user needs and thus, the goals of this thesis.

Based on the examples of museum self-guides collected, the following listing shows the common components and types of information contained in these self-guides:

Elements of Self Guides

Wayfinding

Maps (Basic / Factual Information)
Layout / floor plans
Location of amenities / exits / artifacts
Room labels

Paths (Directing / Instructing / Potential Routing)
Starting location
Descriptions of rooms / galleries
Directions
Numbers / Letters
Intended sequences

Educational

Interpretive Content
Artifact highlights / points of interest
Commentaries
Text / facts about object (critical information)
Text about creator
Text about context / connections
Photos of objects

Activities
Scavenger hunts
Questions and answers

Informational

Other Related Location Offerings
Current / upcoming exhibits
Activities, programs, events
Dates / times

Museum Selection Criteria

With a clear idea of what a museum self-guide encompasses, the next step was locating an appropriate museum self-guide to redesign. A search for museums in cities within a few hours' drive was performed. From this list, on the following page, one was selected based on these criteria: proximity to Rochester, actual need for a guide redesign, existence of an appropriately diverse audience and richness and complexity of content.

Criteria

Need
Would a variably customized guide benefit the museum?
Format choices (paper, size, format)
Design decisions (layout, approach)

Audience
Is the user base large and diverse enough to warrant a variably customized guide?
User range (ages, cultures, education, special needs)
Visitor goals (casual, educational, research, special interests)

Content
Does the content lend itself to being presented in a variably customized format?
Diversity (collection, environment)
Information (depth, complexity, amount)

Additional

How could this information be customized usefully?

Are there distinct enough separations in user groups for meaningful design variations?

Do opportunities exist for multiple levels of depth and presentation of information?

List of Museums Explored

Rochester	ArtisanWorks	artisanworks.net
	Cary Graphic Arts Collection	wally.rit.edu/cary
	The Center at High Falls	centerathighfalls.org
	Corning International Museum of Glass	cmog.org
	Ganondagan State Historic Site	ganondagan.org
	Genesee Country Village & Museum	gcv.org
	George Eastman House	eastmanhouse.org
	Memorial Art Gallery	mag.rochester.edu
	Mount Hope Cemetery	fomh.org
	Rochester Museum & Science Center	rmsc.org
	Seneca Park Zoo	senecaparkzoo.org
	Strong Museum of Play	strongmuseum.com
	Susan B. Anthony House	susanbanthony.com
Buffalo	Albright-Knox Art Gallery	albrightknox.org
	Buffalo & Erie County Botanical Gardens	buffalogardens.com
	Buffalo & Erie County Naval Park	buffalonavalpark.org
	Buffalo Museum of Science	sciencebuff.org
	Buffalo Zoo	buffalozoo.org
	Burchfield Penney Art Center	burchfield-penney.org
	Darwin D. Martin House Complex	darwinmartinhouse.org
	Hallways Contemporary Art Center	hallwalls.org
	Pedaling History Bicycle Museum	pedalinghistory.com
	University of Buffalo Art Galleries	ubartgalleries.buffalo.edu
Toronto	Art Gallery of Ontario	ago.net
	Bata Shoe Museum	batashoemuseum.ca
	Design Exchange	dx.org
	Hockey Hall of Fame	hhof.com
	MZTV Museum of Television	mztv.com
	Ontario Science Center	ontariosciencecentre.ca
	Royal Canadian Military Institute Museum	rcmi.org
	Royal Ontario Museum	rom.on.ca
	St. Lawrence Market Gallery	stlawrencemarket.com
	Textile Museum of Canada	textilemuseum.ca
Syracuse	Erie Canal Museum	eriecanalmuseum.org
	Everson Museum of Art	everson.org
	Museum of Science & Technology	most.org
Albany	New York State Museum	nysm.nysed.gov
	Schenectady Museum & Planetarium	schenectadymuseum.org

Selected Museum
George Eastman House

The George Eastman House: International Museum of Photography and Film, was selected as the content focus for the final application because it satisfied all the requirements for an appropriate location: a large and diverse audience, depth and richness of content and opportunities to improve the current guide to better address user differences.

Audience

As an internationally known museum of photography, it serves a large and wide ranging audience, from local researchers to foreign tourists. While the museum does very well with primary and secondary school groups interested in history, film and photography, they also attract many college and university students and professors with their unique film and photography collections and preservation programs. By far the largest group served by the museum are first-time national and international visitors. Regularly changing museum exhibits, as well as weekly films at the associated Dryden Theatre also attract many local, repeat visitors.

These groups represent a large span of age, education, cultural backgrounds, familiarity with subject matter and reasons for visiting. The complete spectrum of age from small children to senior adults requires the aspects of the museum be presented in different ways and with varying amounts of detail. The span of educational backgrounds and objectives that visitors possess means that varying the choice of subjects will help visitors achieve their goals. Also, the different degrees of familiarity with these subjects means that varying their depth will be beneficial.

Content

In addition to being a historic estate, the George Eastman House also has permanent galleries and travelling exhibits, a film theatre and extensive photography, motion film and technology collections and archives. As a national landmark, the mansion and fully restored gardens allow visitors to immerse themselves in the turn of the century time period. Discovery galleries within the historic house provide further background on George Eastman's life, the Eastman Kodak company and explanation of photography. Museum galleries in the newly added branch of the museum display world-class exhibitions of film and photography. Not only does the George Eastman House possess one of the world's largest archives of film, photography and related technology, but it provides many educational and research opportunities with it's collections. The museum is a great source of film and photography history.

Need

The current guide offered by the George Eastman House is quite large in size and provides a lot of information all at once. This large amount of information is dense and can be overwhelming to a casual or rushed visitor. The guide prominently features maps of the house and gardens and provides very detailed text histories of the house, garden and George Eastman. The amount and size of text may be difficult for some people to read and cause frustration or disinterest. Also, the tour sequences are hard to follow because of a lack of clear progression and illogical starting points. While smaller alternate guides with no map and less content are available in other languages, they do not compensate for main guide's inability to address differences in visitor backgrounds and objectives. (See Appendix E to view the current George Eastman House guide.)

Prototypical Users

In order to reign in the scope of the thesis application, sets of prototypical users were established. These users represent five different typical visitors to the George Eastman House and were chosen to address many of the primary user differences as described on page 56. The first column in the matrix below displays the characteristics of each prototypical user. In the second column, specific criteria for the content and design of the brochure were chosen based on these users' characteristics. The following page categorizes and explains how these design criteria relate to usability and graphic design problem solving.

	Characteristics	**Criteria for Design Solution**
First-time Casual Visitor	Adult First-time visitor Casual visit No specific interests Will stay for approximately 1.5 hours No special needs	No content prioritization 1-2 sentence content paragraphs Prose text 1-2 hour timeframe
International Tourist	Adult First-time visitor Casual visit Interested in house and galleries Will stay whole afternoon International (French speaking)	Galleries and house prioritization 1-2 sentence content paragraphs Prose text 2-3 hour timeframe Written language
Parent with Kids	With kids (1 and 3 years old) First-time visitor Casual visit Interested in aspects that kids will enjoy Will stay as long as kids behave	Garden, galleries prioritization 1-2 sentence content paragraphs Lists of bulleted content 1 hour timeframe Easily read typeface, size, leading
Teen with School Group	Teen with school group Repeat visitor Educational visit with guided group tour Interested in Mr. Eastman and cameras Will stay whole day Winter visit (gardens closed)	Mr. Eastman and collections 3-6 sentence content paragraphs Activities based on content 4-6 hour timeframe
Local Senior Citizen	Senior Local repeat visitor Casual visit Interested in galleries and film aspects Will stay approximately 1 hour Uses reading glasses	Galleries, film and photography 3-6 sentence content paragraphs Prose text 1 hour timeframe Easily read typeface, size, leading

Types of Content Customization

Working with the design criteria for each user from the previous page, five areas of content customization were established. Accompanying each of these five areas are the reasons various aspects of the design would be changed, the type of content changes that would be performed and the semantic operations (as introduced on page 44) that could be applied.

Below, the first five aspects of design and content that will be customized are the aspects of design that do not lend themselves as easily to customization. They will be implemented on each variation and will also help address usability.

	Goals	**Potential Changes to Content**	**Semantic Operations**
Information Prioritization	Emphasizing Focusing	Sections Size, placement, weight Color Value	Add Exchange
Content Depth	Interest Attentiveness	1-2 sentences 2-3 sentences 3-6 sentences	Subtract Substitute
Text Presentation	Accessibility Engagement	Prose Lists Activities	Substitute
Adjustments	Readability Comprehension	Sentence complexity Tone of writing Written language	Substitute
Language	Legibility Visibility	Type (size, leading, face) Image (choice, style, size) Color (contrast, value)	Adjust
Overall Design	Ease of Use	Reduce visual distractions Maintain adequate margins / whitespace	
	Learnability	Image / text relationships Visual aids (numbers, rules) Color coding Strong underlying grid Modules / zones	
	Forgiveness	Redundant coding	

Reasons for Customization Choices

Drawing on the matrix from the previous two pages, this page gives a quick overview of how the aspects of design that are customized benefit usability. The matrix below connects the user criteria from the prototypical users and areas of content customization to each other as well as the five aspects of usability as discussed on page 35.

	User Criteria	**Content Customization**
Effectiveness	Time frame, Interest	Content depth Information prioritization Text presentation
Usefulness	Relevance, Emphasis	Content depth Information prioritization
Satisfaction	Visual Needs, Engagement	Text presentation Adjustments Language
Learnability	Overall Design	
Forgiveness	Overall Design	

Layout Adjustment Exercise

An initial exercise was performed with simple image and text paragraphs to illustrate how design elements could be varied and adjusted. These layouts on pages 60-63 were created to in order to test the initial concepts of how design elements can changed. They demonstrate how typography, hierarchy and sequencing can affect how identical content can be presented to a viewer. In the process of experimenting with these full page layouts some insight into which approaches were most successful were established. The complete set of full size examples can be found in Appendix D.

Original

This layout was established as a base from which all others were modified. It contains the basic placement and elements to be varied.

Library Garden
The library garden is a 1990 adaptation of DeForest's 1921 cut-flower garden. The double row of arborvitae outlines the original central axis with spring-flowering tulips planted in solid blocks of red, white, and purple.

Rock Garden
Restoration of the rock garden was completed in 1992 and was based on historical photographs (ca. 1910) of the original garden. The 250-foot grape arbor was Alling S. DeForest's 1902 grounds plans.

West Garden
The west garden was designed and built by Claude Bragdon in 1917. The wisteria vines on the garden house are original. The three perimeter garden borders and four central beds were planted with perennials and bulbs during Eastman's time.

Northeast Garden
The northeast garden, established during the North Property Rehabilitation Project, is the shadiest, most informal garden on the grounds. A brick walk leads from the grape arbor to the pedestrian gate of the reconstructed University Avenue fence.

East Vista
The east vista, which extends the length of the property from East Avenue to University Avenue, was designed by landscape architect Alling S. DeForest with an informal, naturalistic plantng along the eastern border.

Front Lawn
Rehabilitation of the front lawn on East Avenue began in 1996 and was completed in fall 1999. New plantings include 29 trees (maples, dogwood, and hickory) and more than 300 ornamental shrubs (viburnum, forsythia, jet bead, spireas).

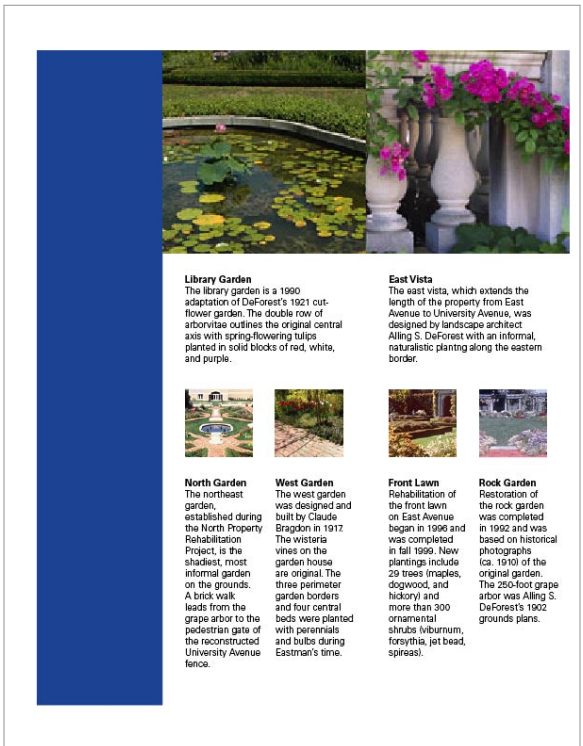
Layout Adjustment Exercise (continued)

Prioritized Content

This layout uses size and the relationships of sizes to create emphasis. Prioritized image and text sets are enlarged and the remaining sets are reduced in size.

Clear Visual Hierarchy

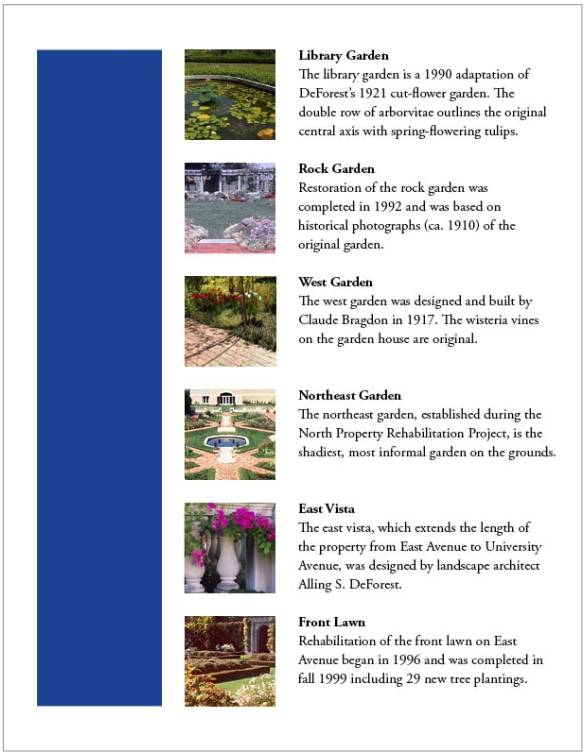
This layout uses size and placement to establish priority. Images for emphasized text and image sets are enlarged and placed at the top of the page, two across. The remaining sets remain the same size but with smaller columns and arranged underneath the emphasized sets.



Layout Adjustment Exercise (continued)

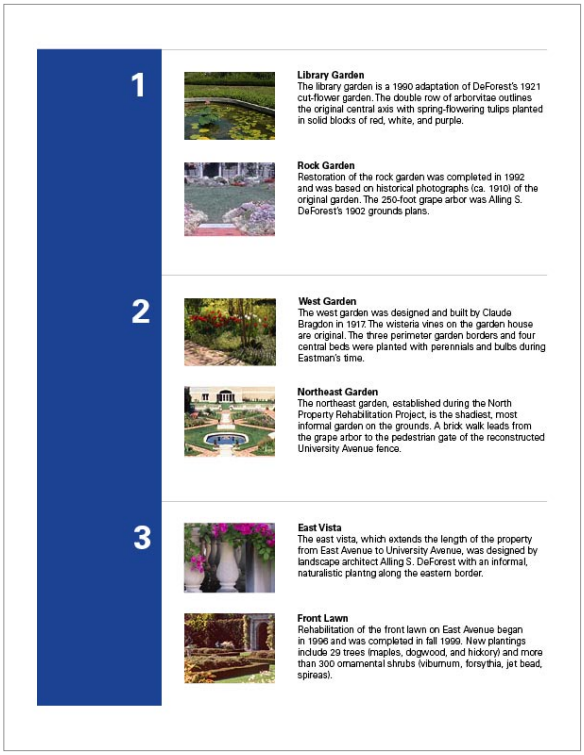
Typographic Adjustments

This layout only changes typographic variables. Text size was increased and the typeface was changed to a serif font.



Secondary Typographic Elements

This layout adds typographic elements to group and sequence image and text sets. The rule and spacing above and below the groups signals the start and end of a group. The numbers further identify the groups as units and reinforces the top to bottom sequencing.



Levels of Variability

Having established the aspects of content that will be variable (page 58) and some design approaches to address them (pages 60-62), it was important establish how customization of the whole page could be facilitated with design. The table below was conceived to place the different levels of page variability in context in order to identify the most appropriate approach. For each level, the layout, type and images are either fixed or variable. Based on which of the three elements are variable, each level allows different semiotic operations to be performed. For example, a document at the versioned level might have a few choices of layouts each with fixed text and images.

	Layout	Type	Image	Possible Operations
Fixed	Fixed	Fixed	Fixed	None
	Fixed	Fixed	Variable	Add, Subtract, Substitute
Partially Variable	Fixed	Variable	Variable	Add, Subtract, Substitute Adjust
Versioned	Variable	Fixed	Fixed	Exchange
	Variable	Fixed	Variable	Exchange, Add, Subtract, Substitute
Fully Variable	Variable	Variable	Variable	Exchange, Add, Subtract, Substitute, Adjust

Fixed
At this level, the entire design is fixed and does not change. This is the level at which most print documents function. One version is created for all users which allows for simpler production.

Partially Variable
At this level, text and imagery can be added, subtracted or substituted and text can be adjusted depending on the needs of users or objectives of the business. This is the level of functionality at which most VDP documents operate. It allows more relevant information to be used on an individual basis.

Versioned
At this level, entire design versions are interchanged. Individual text paragraphs and images are not changed independently but may be different on each version. This approach allows common differences among groups of users to be addressed.

Fully Variable
At this level, text and image content as well as layout can change according to individualized needs. This level of variability enables documents to adjust entire approaches to presenting content and accommodates greater variability in content.

This level of layout and content variability was chosen to proceed with since it provides the greatest possibilities in terms of design customization and is the most unexplored area of the levels.

Fully Variable
Relative Positioning Approach

Concept

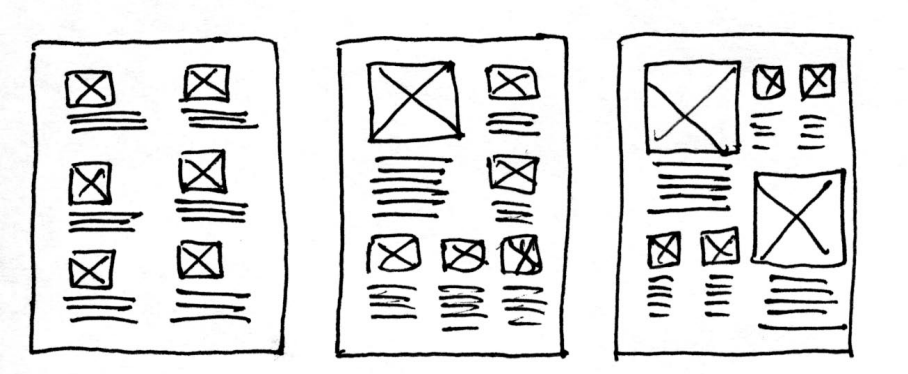
In this hypothetical design approach to creating fully variable documents, each page component, such as an image or block of text, would retain its relative position to others regardless of adjustments to itself. To achieve this, components must respond to changes in adjacent ones. For example, if a component was emphasized by enlarging the space occupied on the page, its relative location on the page would stay the same and surrounding components would get smaller or move over.

Strengths

This approach would allow individual components to be adjusted without having to adjust the whole page layout or sequence. It offers the potential for greater freedom in customizing individual parts.

Weaknesses

In order to implement this approach, sophisticated software would need to be used to control how surrounding components are affected by changes to individual components. This becomes even more complex when multiple components are adjusted and both affect a shared adjacent component.



The concept sketch above shows how as one component is enlarged to require more space on the page, surrounding elements adjust accordingly. In the left example all components are equal. In the center and right examples one, then two components cause the rest to resize.

Fully Variable
Modular Approach

Concept

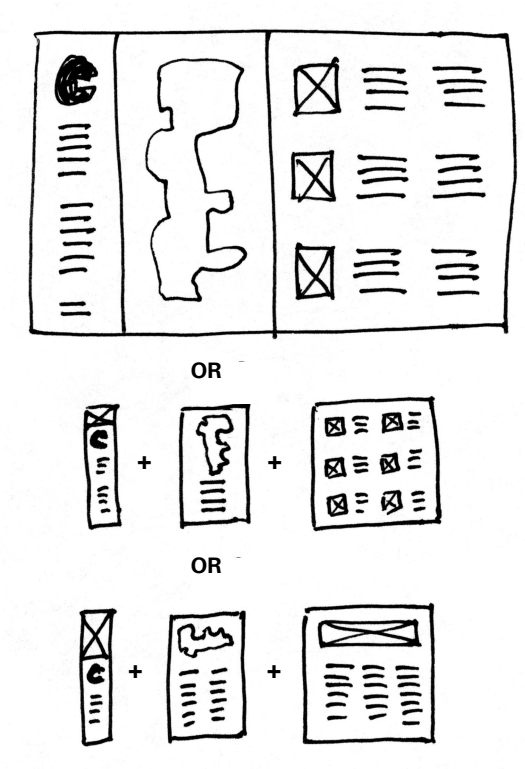
Another hypothetical design approach to creating fully variable documents is by implementing interchangeable modules. Each module, or group of components, would have a set size and basic compositional arrangement that would only fit into predetermined locations on the page. Each of these module locations could either allow modules with different presentations of the same information to be used or modules with different content altogether. Depending on which of these approaches was used, a design could facilitate content prioritization or content customization.

Strengths

This approach lends itself well to setting up and dividing information zones on the page, thereby allowing certain types of content to fit into predetermined locations. It also enables each module to vary independent of other modules.

Weaknesses

While this approach enables independent adjustments within each module without affecting other modules, it also requires each module to be created in advance. It would also be necessary to plan how the modules would visually interact when placed in certain combinations in the final design.



The concept sketch above shows how modules with different layouts and content could be placed in predetermined locations on the page.

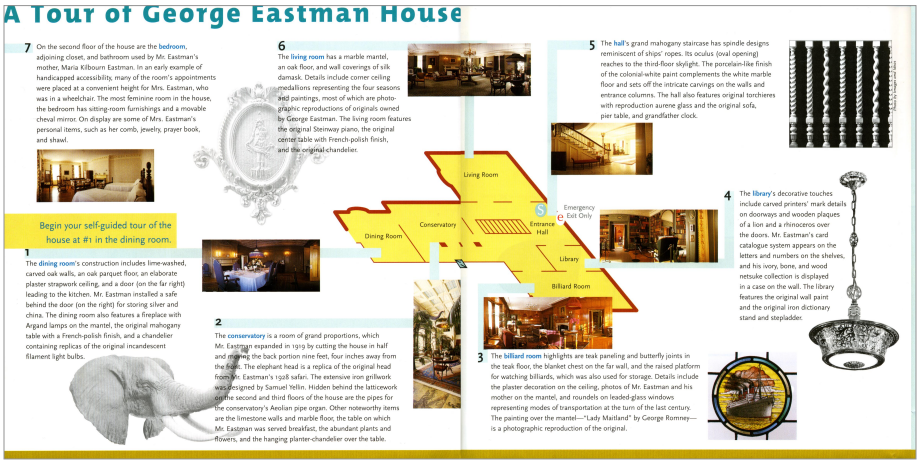
Transition from Existing Museum Guide

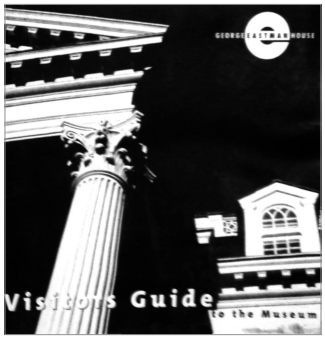
The first step taken in redesigning the existing George Eastman House museum guide was transferring the content from the existing 16"x 24" guide to the smaller 12"x 18" printing size necessary for this thesis application. (See conversation with John Eldridge, page 16.)

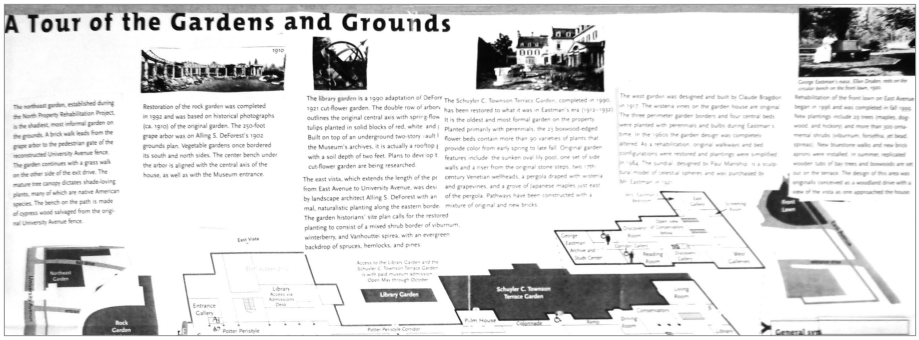
In order to determine if the amount of content from the existing guide could feasibly fit onto the new paper size existing guide content was reduced by 75% and arranged on a 12"x 18" sheet. It was determined that the photos that were still useful at this reduced size but that the smaller text was difficult to read. To remedy this full size text was used and with the reduced images.

This process of arranging existing elements on a smaller size paper revealed that amount of text would need to be reduced, unnecessary images would need to be removed and that the four different maps used in the existing guide would be need to condensed into one detailed map.

See Appendix E for a larger, complete version of the existing George Eastman House museum guide.







Above: The existing cover and inside layout of the existing brochure.
Below: The resulting cover and partial inside of the reduced brochure.

New Layout
Version 1

Format

After establishing that most of the content from the original brochure would plausibly fit on an 12”x 18” sheet, ideation continued using this paper size. In order to accommodate the largest map possible the brochure remained a horizontal trifold.

Layout

To facilitate a sequential tour order, the inside spread divided each panel of the brochure into two columns. In this way every garden and room could be placed in their own columns and be sequenced from left to right. This version does not implement any customization and has fixed content with fixed locations. The house and gardens are emphasized on the inside spread and the inside front panel briefly lists all the activities available at the George Eastman House.

Imagery

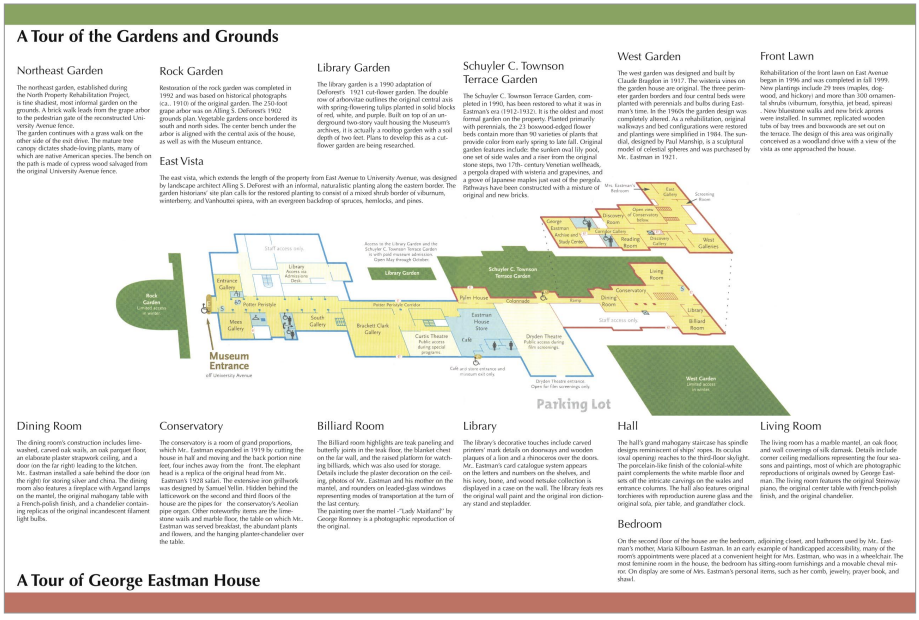
The front cover uses the same photo from existing brochure thought with a more vertical crop. This photo appropriately represents the historic and photographic subject matter of the George Eastman House. On the inside, a single detailed map was selected and enlarged to reduce the number of maps. On the back cover two photos were selected to help show what is offered at the museum. The remaining images from the existing brochure were excluded.

Color

The green and orange-red colors used in the existing map were used as color bands to designate and highlight the location of text relating to the garden and house respectively.

Typography

A transitional typeface, Optima, was used for titles, subtitles and body text for added readability. The nine point text was easily read and fit comfortably within the three inch columns.



New Layout
Version 2

Format

This version uses the same 12"x 18" horizontal trifold format as the previous version.

Layout

This version implements a modular approach to each topic within the museum. Using the same two columns per panel, a system of single, double and triple column sections was used to place emphasis on certain topics. Each topic (Garden Tour, House Tour, Galleries, Film and Photography, George Eastman, and Families and Kids) is then given a weight based on its importance to the user and placed into the section corresponding to its importance. The greatest emphasis section with three columns was positioned in a more central location to command more attention. Colored title bars were placed at the top of each section to easily identify their beginning and end.

Imagery

Images were situated directly under the title bars to help identify and reinforce the topic of each section. A photo that shows both the historic architecture of the house and the full splendor of the garden was selected for the cover.

Color

The color palette from the previous version were extended to include a royal blue often used in George Eastman House collateral and a magneta used in many of their promotional brochures.

Typography

This version continued to use the Optima typeface but increased the contrast between the type sizes of the titles and subtitles.

New Layout
Version 3

Format

This new set of layouts uses the same 12”x 18” size but was changed to a vertical trifold format. This was done to move the map to the inside panel thereby freeing more space for text on the inside spread.

Layout

This was the first version to implement three separate layout approaches. An equal emphasis approach in which each section is displayed and given equal space on the page. A modular approach similar to the previous version where sections with greater emphasis are given more columns, instead of rows, and again placed more centrally on the page. Finally, a relative position approach was used. The sections emphasized on this approach are given more space and affect the size of the other sections.

Imagery

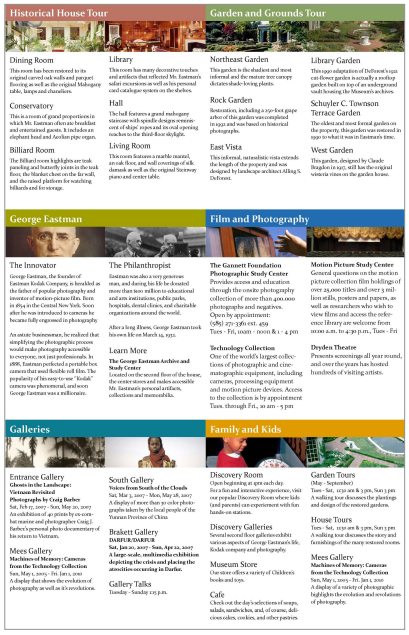
Similar to the previous version, images were placed directly under the title bars to help identify and reinforce the topic of each section. Each section in all of these versions have the same number and sizes of images. The relative positioning approach reduced the image size for de-emphasized sections.

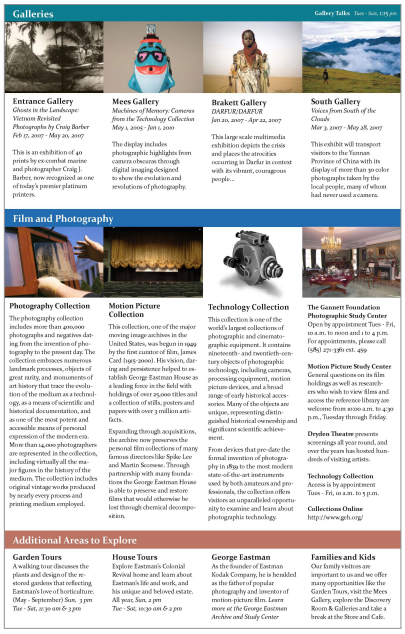
Color

Further extending the previous four color palette (green, orange-red, royal blue and magenta) were teal, olive green and yellow-orange colors to represent the Galleries, George Eastman and Families and Kids sections respectively. Also implemented in the relative positioning approach was the use of color screens to help emphasize sections by giving them more visual weight.

Typography

In this version the typeface was switched to Microsoft’s new serif typeface, Constantia, to further increase readability.





New Layout
Version 4 - Equal Emphasis Layout

Format

This version uses the same 12”x 18” vertical trifold format as the previous version.

Layout

Implementing a grid of six units across and nine down (see right layout below), the equal emphasis layout used one unit for the section photographs, two for the color title bar and six units for the section text. This allowed more space and a wider column for section text. The color title bars were then also used for supplemental information.

Imagery

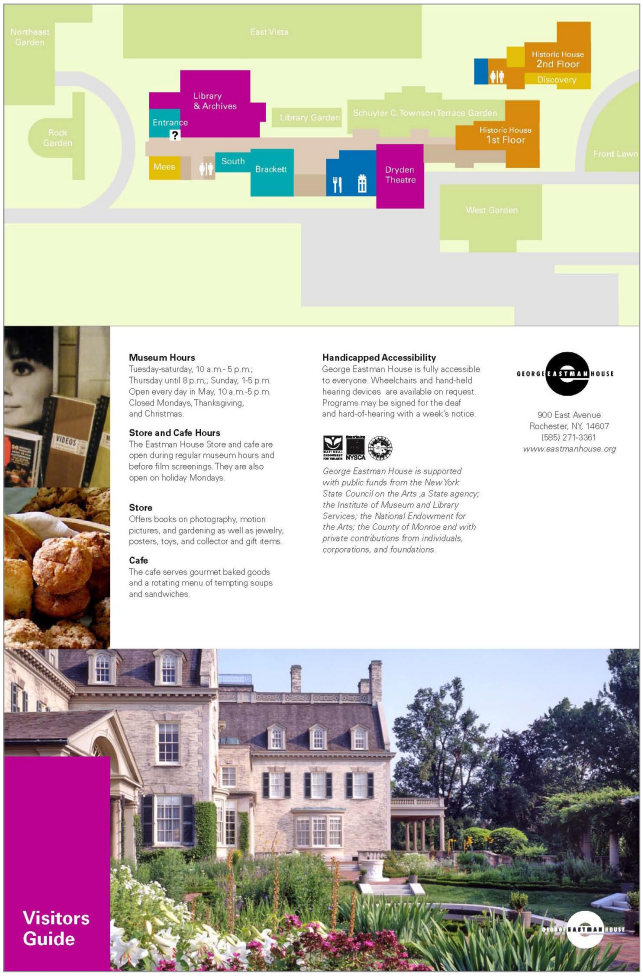
A single image was used to represent and help identify each section. Colors now correspond to rooms and spaces on the map.

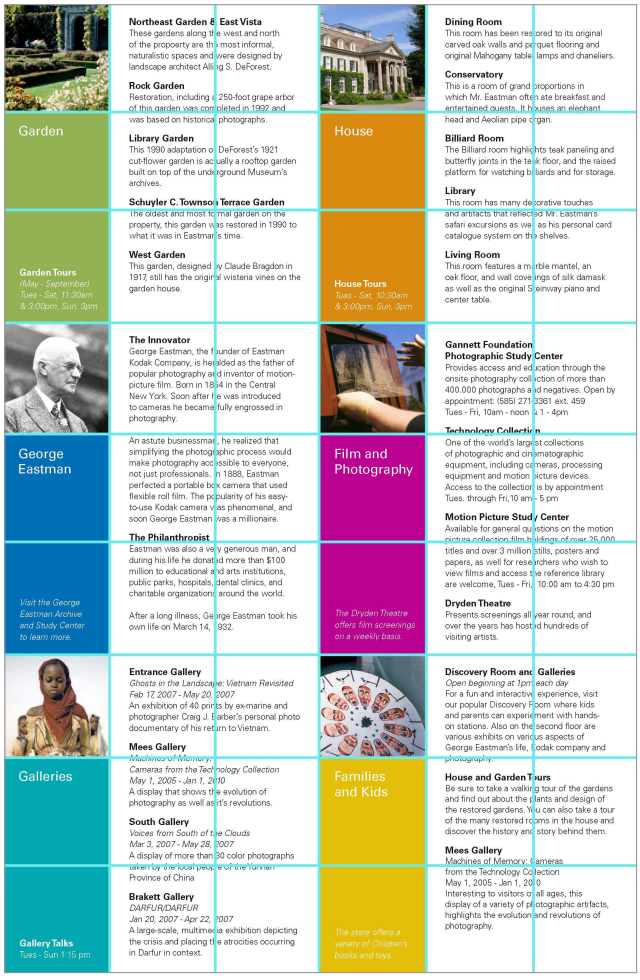
Color

The six colors used in the previous version were refined to match similar colors used as variations for the logo on the museum’s website. These adjusted colors were brighter and more distinct from each other.

Typography

A sans serif typeface, Univers, was implemented to reflect the typeface used in the George Eastman House logo and give the guide a more contemporary look while still retaining its readability.





New Layout
Version 4 - Modular Approach

Format

This version uses the same 12"x 18" vertical trifold format as the previous version.

Layout

Implementing a grid of four units across and six down (see right layout below), this modular layout used a horizontal set of twelve, eight and four units for the three levels of section emphasis. The width of these units easily accommodated columns and helped dictate where text was placed and how it flowed within the sections. Like the previous version, sections are interchangeable and placed according to emphasis.

Imagery

The number of images used for each section decreases with the declining emphasis of the sections. In addition, numbers corresponding to the subsections of each section were placed on each image if a representative image was shown.

Color

This version uses the same six colors and also uses them to color code the areas on the map. In addition to the numbered images, numbers also label where each subsection is on the map.

Typography

A serif typeface, Constantina, was implemented on this version as a potential typeface for users with low vision.

New Layout
Version 4 - Relative Positioning Approach

Format

This version uses the same 12"x 18" vertical trifold format as the previous version.

Layout

Implementing the same grid of four units across and six down (see right layout below), this relative positioning layout allocated either two or eight units depending on a section's emphasis. This allowed much more content in the emphasized sections and much less content in the de-emphasized sections.

Imagery

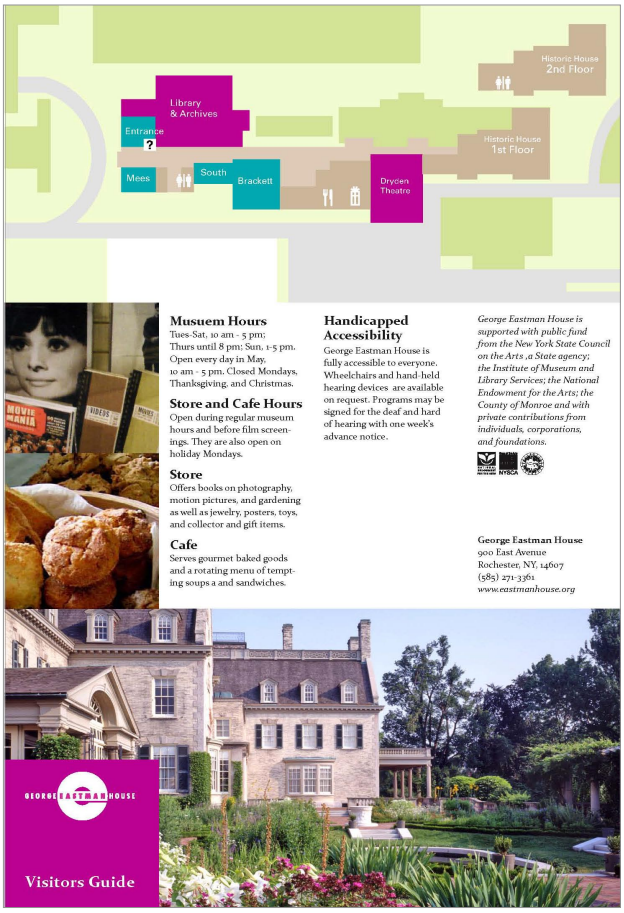
Two images were used for emphasized sections and half-sized images were used in de-emphasized sections. The two images helped provide more information for the emphasized sections and the half-sized images helped to de-emphasize the smaller sections.

Color

This version also uses the same six colors and again used them to color code the areas on the map. No numbering of images or subsections on the map were implemented on this version. Color screens were again used to further emphasize the larger sections.

Typography

The typeface Constantina was used on this version as a potential typeface for visitors with low vision.



Overview

The purpose of this intermediate evaluation was to test the helpfulness and appropriateness of the current ideation models shown on pages 70-72. Three sets of questions were posed. The first set of questions related to practical and technical issues such as the choice of size and format as well as typographic decisions. The second set of questions focused on visual and aesthetic concerns such as whether the approaches to prioritizing content were successful and referencing between them map and text easy. The third set of questions concerned the clarity of meaning and the communicative success. These questions endeavored to determine if images were used effectively and whether the different amounts of text were appropriate. Through these questions it was possible to evaluate the differences among the two VDP approaches, relative positioning and modular. These questions also helped determine if the graphic design decisions and ways in which usability was addressed were also successful. Because these questions related to overall approach issues only a single set of versions was used, that of the first-time adult visitor. Together with the questionnaire, the two versions helped obtain constructive feedback.

Audience & Location

The audience for this project is very diverse. It includes people of many ages, cultures and backgrounds with different needs, interests and objectives. To survey this wide audience in a reasonable time frame, the Student Alumni Union on campus at the Rochester Institute of Technology was selected. The large volume of students, faculty, and visitors that pass through this building provided the needed variety of evaluators.

Evaluation Procedure

Each participant was given a single page questionnaire and asked to answer the questions based on two sample designs presented to them (shown on pages 75-76). First, they filled out the evaluator background section on the questionnaire which collected information about their age, occupation and whether they had children. It also asked questions related to the George Eastman House, such as whether they had visited it, how many times they had visited, and which aspects they would be interested in learning about. Next, they were shown the two versions of the guide, the relative position approach and the modular approach, and asked to answer a series of questions for each version.

The following pages display a sample questionnaire form, the two versions of the guide that were used and the results of the survey.

Sample Questionnaire Form

George Eastman House Brochure Evaluation

William Wells
MFA Candidate

Evaluator Background and Interests

Age: _____ Occupation: _____ Do you have children? ◯ Yes ◯ No

Have you visited the George Eastman House? ◯ Yes ◯ No If Yes, how many times: _____

Length of time typically spent at museums: ◯ 1-2 hours ◯ 2-3 hours ◯ 4-6 hours

Pick TWO aspects of the George Eastman House you would be interested in learning more about:

◯ House ◯ Gardens ◯ George Eastman ◯ Galleries ◯ Archive & Collections ◯ Family

Brochure Evaluation

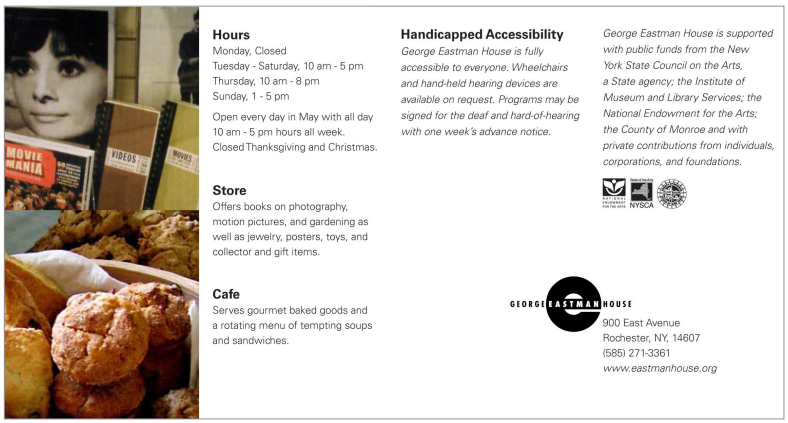
Please fill in your responses to the following statements based on the two layouts you have reviewed.

		Version A					Version B				
	Practical / Technical	Disagree				Agree	Disagree				Agree
1	The text size, font and spacing is easy to read.	1	2	3	4	5	1	2	3	4	5
2	Opening and using the guide is logical.	1	2	3	4	5	1	2	3	4	5
3	The size and format is easy to use.	1	2	3	4	5	1	2	3	4	5
	Comments / Suggestions:										
	Visual / Aesthetic	Disagree				Agree	Disagree				Agree
4	Text columns and margins feel comfortable.	1	2	3	4	5	1	2	3	4	5
5	Cross referencing between text and map is easy.	1	2	3	4	5	1	2	3	4	5
6	Approach to prioritizing interests is effective.	1	2	3	4	5	1	2	3	4	5
	Comments / Suggestions:										
	Meaning / Communicative	Disagree				Agree	Disagree				Agree
7	Selected imagery helps reinforce written text.	1	2	3	4	5	1	2	3	4	5
8	Expanded text on select interests is valuable.	1	2	3	4	5	1	2	3	4	5
9	Amount of text is appropriate.	1	2	3	4	5	1	2	3	4	5
10	Which version do you feel was more successful?	◯ A		◯ B							
	Comments Overall?										

Version A

Front Cover

Back Cover



Inside Spread
Top Panel

Inside
Front Panel

Version A (continued)

Inside Three-panel Spread

Gardens

The history, architecture and horticulture of the landscape during George Eastman's period of ownership (1902 - 1932) are being carefully preserved, conserved, and interpreted for the public by museum staff, volunteers and docents. *Garden tours are offered daily, May through September.*

George Eastman

As the founder of Eastman Kodak Company, he is heralded as the father of popular photography and inventor of motion-picture film. During his life Eastman donated more than $100 million to education and charities around the world. *Learn more at the George Eastman Archive and Study Center on the second floor of the historic house.*

Galleries

Gallery Talks
Tues - Sun, 1:15 pm

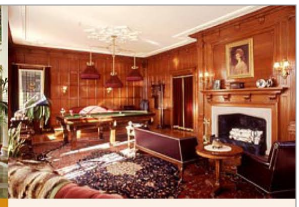
Brakett Gallery
DARFUR/DARFUR
Jan 20, 2007 - Apr 22, 2007
Genocidal conflict in Darfur, Sudan has resulted in the death or injury of more than 400,000 civilians since 2003. In partnership with the DARFUR / DARFUR organization, This large-scale, multimedia exhibition depicts the crisis and placing the atrocities occurring in Darfur in context with its vibrant, courageous people...

Entrance Gallery
Ghosts in the Landscape: Vietnam Revisited
Feb 17, 2007 - May 20, 2007
George Eastman House presents Ghosts in the Landscape: Vietnam Revisited, an exhibition of 40 prints by ex-combat marine and photographer Craig J. Barber. Now recognized as one of today's premier platinum printers, Barber spent twenty months in Vietnam as an 18-year-old, rarely knowing exactly where he was or the logic of what he was being told to do.

Mees Gallery
Machines of Memory: Cameras from the Technology Collection
May 1, 2005 - Jan 1, 2010
"All the things the public most wants to see from the technology collection," that's how Technology Curator Todd Gustavson describes this exhibit of photographic highlights from camera obscuras through digital imaging designed to show the evolution of photography as well as it's revolutions.

South Gallery
Voices from South of the Clouds
Mar 3, 2007 - May 28, 2007
George Eastman House will transport visitors to the Yunnan Province of China via the exhibition Voices from South of the Clouds, on view March 3 through May 28, 2007. The display of more than 30 color photographs taken by the local people (many of whom had never used a camera) — all using Kodak cameras and film — also features accompanying first-person stories...

Traveling Exhibitions
One aspect of George Eastman House's mission is to share our collections through traveling exhibitions. We are fortunate in that our photography collection has great depth and breadth encompassing the entire history of the medium. Eleven of our offered exhibitions are completely from our collections.



House

House Tours
Tues - Sat, 10:30 am and 3:00 pm
Sun, 3:00 pm

Dining Room
This room has been restored to the original carved, lime-washed oak walls, oak parquet floor and elaborate plaster strapwork ceiling. It also features a fireplace mantel with Argand lamps, original mahogany table and chandelier.

Conservatory
This is a room of grand proportions with limestone walls and marble floors. The elephant head is a replica of the original head from Mr. Eastman's 1928 safari. Hidden behind the latticework on the upper floors of the house are the pipes for an Aeolian pipe organ.

Billiard Room
This rooms highlights are teak paneling and butterfly joints in the teak floor, and the raised platform for watching billiards and storage. Details include rounders on the windows representing modes of transportation at the turn of the last century.

Library
This room has many decorative touches including carved printers' mark details on doorways and wooden plaques of a lion and a rhinoceros over the doors. Mr. Eastman's card catalogue system appears on the letters and numbers on the shelves, and his ivory, bone, and wood netsuke collection is displayed in a case on the wall.

Hall
The hall's grand mahogany staircase has spindle designs reminiscent of ships' ropes. Its oculus (oval opening) reaches to the third-floor skylight. The hall also features original torchieres with reproduction aurene glass and the original sofa, pier table, and grandfather clock.

Living Room
This room has a marble mantel, an oak floor, and wall coverings of silk damask. The living room features the original Steinway piano, the original center table with French-polish finish and corner ceiling medallions representing the four seasons and paintings

Bedroom
This second floor room with adjoining closet and bathroom was used by Mr. Eastman's mother, Maria Kilbourn Eastman. The most feminine room in the house, the bedroom has a movable cheval mirror and displays personal items, such as her comb, jewelry, prayer book, and shawl.

Film and Photography

The Eastman House has one of the worlds largest collections of film titles, photo negatives and related technology. The Gannett Photographic Study Center, Motion Picture Study Center and Dryden Theatre are just some of the ways the collections are shared. *Learn more by these collections by inquiring at the front desk.*

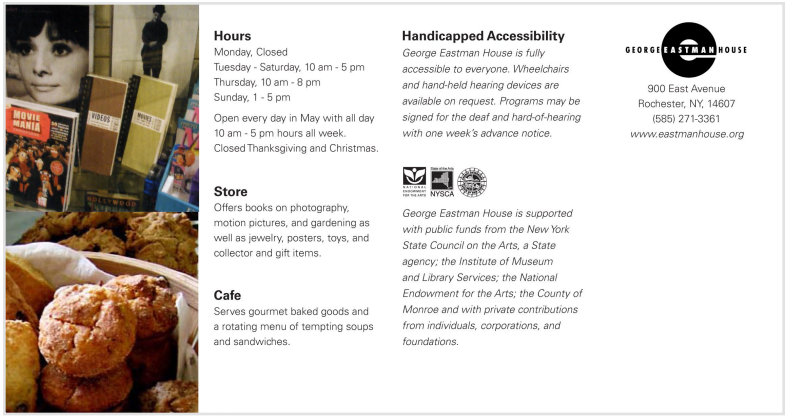
Families and Kids

Our family visitors are important to us and we offer many opportunities specific for our young visitors. See the list to the right and feel free to inquire further at the front desk. *Be sure to include the Garden Tours, Mees Gallery, Discovery Room & Galleries, and Musuem Store and Cafe in your plans.*

Version B

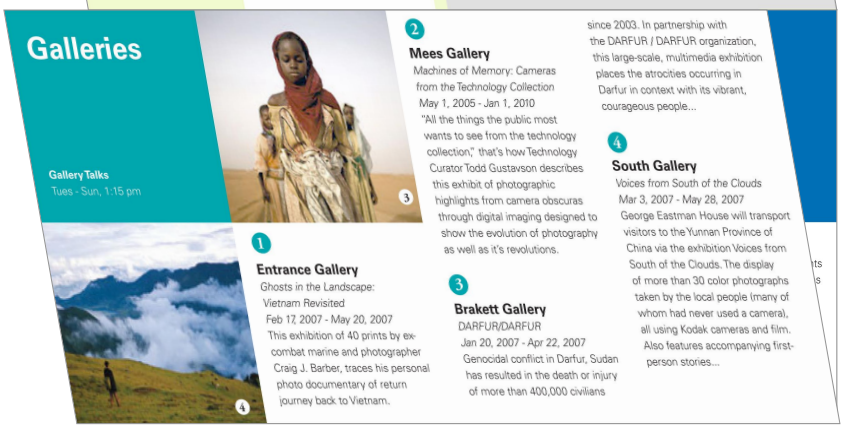
Front Cover

Back Cover



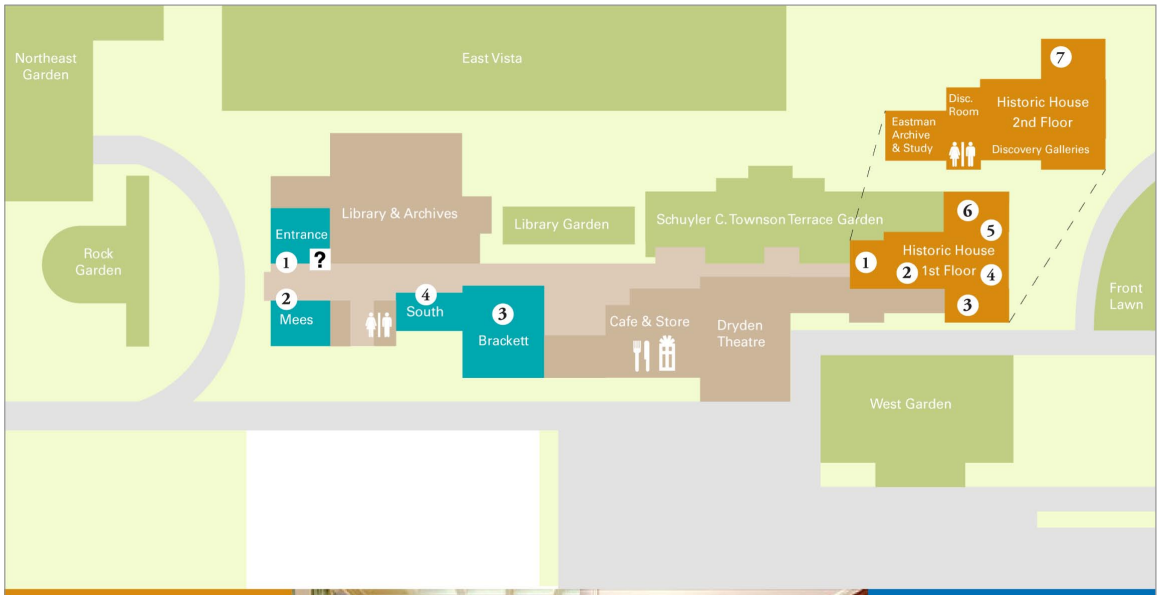
Inside Spread
Top Panel

Inside
Front Panel



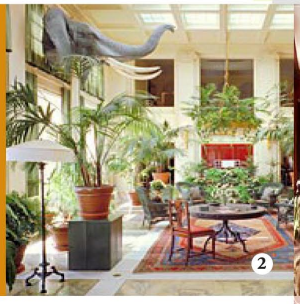
Version B (continued)

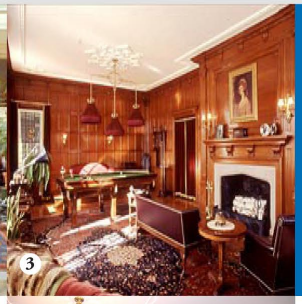
Inside Three-panel Spread

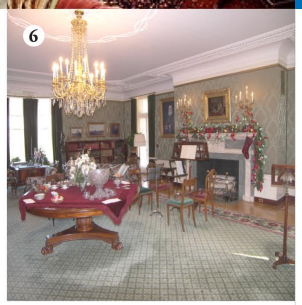


House

House Tours
Tues - Sat, 10:30 am and 3:00 pm
Sun, 3:00 pm







1 Dining Room

This room has been restored to the original carved, lime-washed oak walls, oak parquet floor and elaborate plaster strapwork ceiling. It also features a fireplace mantel with Argand lamps, original mahogany table and a chandelier with replica incandescent filament bulbs. Mr. Eastman installed a safe for storing silver and china.

2 Conservatory

This is a room of grand proportions with limestone walls and marble floors. The elephant head mounted on the wall is a replica of the one from Mr. Eastman's 1928 safari. The extensive iron grillwork was designed by Samuel Yellin and behind the latticework on the upper floors are the pipes for an Aeolian pipe organ.

3 Billiard Room

This rooms highlights are teak paneling and butterfly joints in the teak floor, the blanket chest on the far wall, and the raised platform for watching billiards and storage. Details include the photos of Mr. Eastman and his mother on the mantel, and rounders on the windows representing modes of transportation at the turn of the last century.

4 Library

This room has many decorative touches including carved printers' mark details on doorways and wooden plaques of a lion and a rhinoceros over the doors. Mr. Eastman's card catalogue system appears on shelves, and his ivory, bone, and wood netsuke collection is displayed in a case on the wall.

5 Hall

The hall's grand mahogany staircase has spindle designs reminiscent of ships' ropes. Its oculus (oval opening) reaches to the third-floor skylight. The hall also features original torchieres with reproduction aurene glass and the original sofa, pier table, and grandfather clock.

6 Living Room

This room has a marble mantel, an oak floor, and wall coverings of silk damask. The living room features the original Steinway piano, the original center table with French-polish finish and corner ceiling medallions representing the four seasons.

7 Bedroom

This second floor room with adjoining closet and bathroom was used by Mr. Eastman's mother, Maria Kilbourn Eastman. The most feminine room in the house, the bedroom has a movable cheval mirror and displays personal items, such as her comb, jewelry, prayer book, and shawl.

More to Explore

Garden Tours

A walking tour discusses the plants and design of the restored gardens that reflecting Eastman's love of horticulture.
Tues - Sat, 11:30 am & 3 pm
Sun, 3 pm from May - September

George Eastman

As the founder of the Eastman Kodak Company, he is heralded as the father of popular photography and inventor of motion-picture film.

George Eastman Archive and Study Center
Located on the second floor of the house, the center stores and makes accessible Mr. Eastman's personal artifacts, collections and memorabilia.

Archive & Collections

The Eastman House has one of the worlds largest collections of film titles, photo negatives and related photographic technology.
Learn more about opportunities to access the collections by inquiring at the front desk.

Families and Kids

Our family visitors are very important to us and we offer many opportunities like the Garden Tours, Mees Gallery, the Discovery Room and our Store and Cafe.

Evaluation Results

		Version A					Version B				
	Practical / Technical	Disagree				Agree	Disagree				Agree
1	The text size, font and spacing is easy to read.	0	0	1	6	11	0	0	0	8	10
2	Opening and using the guide is logical.	1	2	2	9	4	0	1	2	6	9
3	The size and format is easy to use.	0	3	1	5	9	0	3	1	4	9

Overall brochure is very bulky.
Very large brochure.
Pamphlet is too large.

	Visual / Aesthetic	Disagree				Agree	Disagree				Agree
4	Text columns and margins feel comfortable.	1	2	5	4	6	0	0	1	9	8
5	Cross referencing between text and map is easy.	2	4	1	9	2	0	1	3	5	9
6	Approach to prioritizing interests is effective.	1	2	3	8	2	0	0	4	7	6

A looks more attractive as a whole
but B makes more sense to read.

B reads better with the trifolds.
I like the number approach on Version B.
The numbers on version B were useful.
Numbered map on the same page works better.
A flows easier but B's map is better.
Map is hard to relate in A.
Make colored backgrounds darker on use on all sections.
Use screens on B?

Take numbers off of images.
Thin black line bothered me.

	Meaning / Communicative	Disagree				Agree	Disagree				Agree
7	Selected imagery helps reinforce written text.	0	0	6	5	7	0	1	6	5	6
8	Expanded text on select interests is valuable.	0	0	2	11	5	0	0	5	8	5
9	Amount of text is appropriate.	0	3	3	7	5	0	1	3	7	6

A little more info about other areas might be nice.

10	Which version do you feel was more successful?	4 A	13 B	1 Blank

Evaluation Analysis

Evaluator Backgrounds

The range of the eighteen evaluators ended up being much narrower than expected. The age range of evaluators was between 18 and 23 years old. Also, the evaluators were all primarily students. Eight evaluators had previously been to the George Eastman House a single time and one evaluator had been six times. Ten evaluators said they typically spend two to three hours at museums, six responded one to two hours and two responded four to six hours. The most popular choices for areas of interest at the George Eastman House in order from highest responses to lowest were the galleries, the historic house, the archives and collections, the gardens and finally George Eastman.

Evaluator Results

Based on the responses to the questionnaire, a few aspects if the guides were identified as needing improvement. First, many evaluators found both versions of the 12"x18" guides to be too large. Second, many evaluators found the text columns and margins in version A to be slightly uncomfortable and the text columns and margins in version B to be fine. Some evaluators also found version A to be less logical to open and use than version B and quite a few did not find cross referencing between text and the map easy in version A. For both versions, evaluators found the expanded text on selected interests valuable but some still felt the amount of text in other areas to be lacking. Version B received great praise for its approach to prioritizing through placement within the guide and its use of numbers to connect specific areas to the map. It was apparent from the results, comments and answers on the final question, that version B, the one that used the modular approach, was the more successful method of implementation.

Significance

This intermediate evaluation provided a clear indication of which approach to addressing usability with a variable design was more successful. It also provided insight into what a subset of visitors to the George Eastman House would value in a museum guide. The lack of a diverse set of evaluators and the time and motivation constraints of the evaluation would need to be addressed in order to make this evaluation a credible source of results.

Introduction

The final implementation of this thesis application is the result of continued refinement based on comments and suggestions from thesis committee members and the participants of the intermediate evaluation. It used the most successful design approach, the modular version, and improved on design, usability and variable data print aspects. Below are the overall design modifications made to the modular layout approach used in the intermediate evaluation. (See page 77-78.)

Design Modifications

The first decision made was to implement the modular approach. An overwhelming response from the intermediate evaluation agreed that this approach was more successful than the relative positioning one. The modular approach allowed the map to be positioned on the top of the three panel inside spread which made referencing easier from both the inside spread and folding panel.

The second decision was to address the concerns from evaluators that the guides were too large and awkward to handle. This was easily remedied by changing the paper size to 11"x 17". Surprisingly, adjusting the design to fit this smaller space was easily accomplished, perhaps in part due to a change described in the next paragraph.

Although most readers found the 11 point body type with 15 point line spacing easy to read it was apparent from observation that the average user did not need text this big. In an effort to allow more space for content and improve the rags in the small columns, the type size was reduced by one point size.

One aspect that was encouraged in the early stages of ideation by advisors and was found very successful in the modular version, was the use of corresponding numbers on the map for each part of a content section. Evaluators found this helped them refer between text descriptions and map locations. Evaluators also found that having the map always visible no matter which content section they were looking at, as was done in the modular version and not the relative positioning version, made using the guide easier.

Final Designs

With these changes implemented, three iterations of the modular design approach were created. Each iteration shows how a prototypical visitor's interests and needs are met through this thesis application. The choice to use these specific prototypical users was made because the combination of traits was sufficient to show most major concepts developed in this thesis.

The following pages are the final designs with descriptions of each visitor and the rationale behind the design decisions.

Final Design - Visitor 1

Characteristics

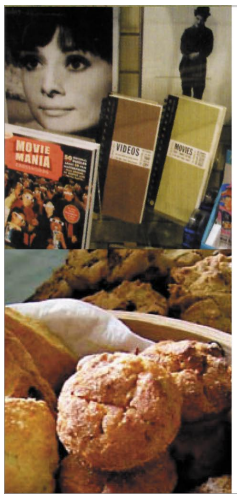
First-time, casual adult visitor
Will stay the whole afternoon.
Interested in house and galleries.

Design Decisions

Use normal type size and leading.
Use prose text with 1-2 sentence content descriptions.
Prioritize house and gallery content.

Front Cover

Back Cover



Hours
Monday, Closed
Tuesday - Saturday, 10 am - 5 pm
Thursday, 10 am - 8 pm
Sunday, 1 - 5 pm

Open every day in May with all day 10 am - 5 pm hours all week.
Closed Thanksgiving and Christmas.

Store
Offers books on photography, motion pictures, and gardening as well as jewelry, posters, toys, and collector and gift items.

Cafe
Serves gourmet baked goods and a rotating menu of tempting soups and sandwiches.

Handicapped Accessibility
George Eastman House is fully accessible to everyone. Wheelchairs and hand-held hearing devices are available on request. Programs may be signed for the deaf and hard-of-hearing with one week's notice.

George Eastman House is supported with public funds from the New York State Council on the Arts, a State agency; the Institute of Museum and Library Services; the National Endowment for the Arts; the County of Monroe and with private contributions from individuals, corporations, and foundations.

GEORGE EASTMAN HOUSE

900 East Avenue
Rochester, NY, 14607
(585) 271-3361
www.eastmanhouse.org

Final Design - Visitor 1 (continued)

Inside Spread
Top Panel

Inside
Front Panel

Final Design - Visitor 1 (continued)

Inside
Three-panel
Spread

Final Design - Visitor 2

Characteristics

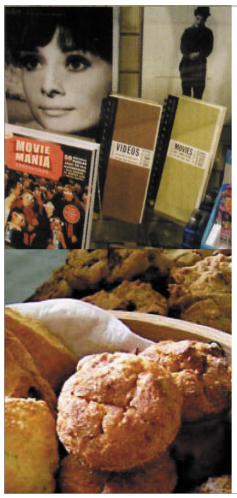
Parent with kids
First-time visitor
Will stay a short time.
Interested in aspects that kids will enjoy.

Design Decisions

Use normal type size and leading.
Use lists of facts with short length content descriptions.
Prioritize gardens and gallery content.

Front Cover

Back Cover



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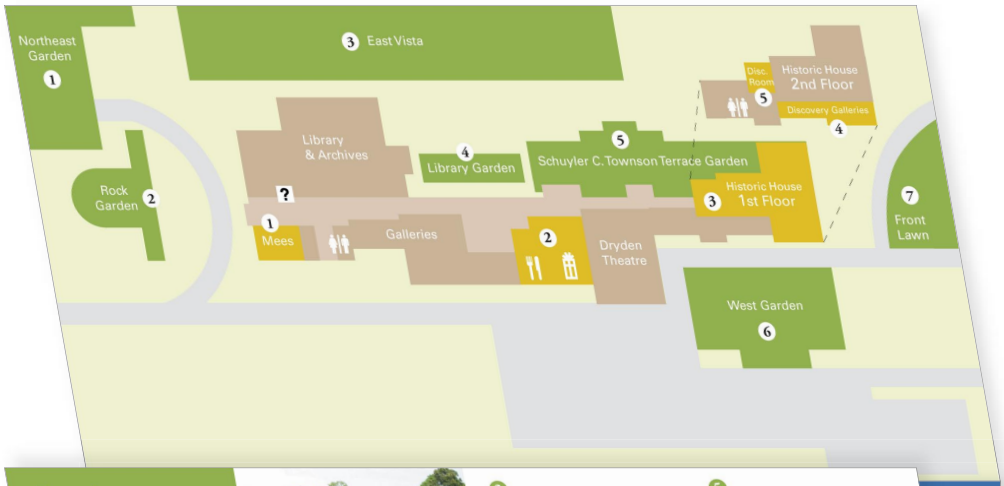
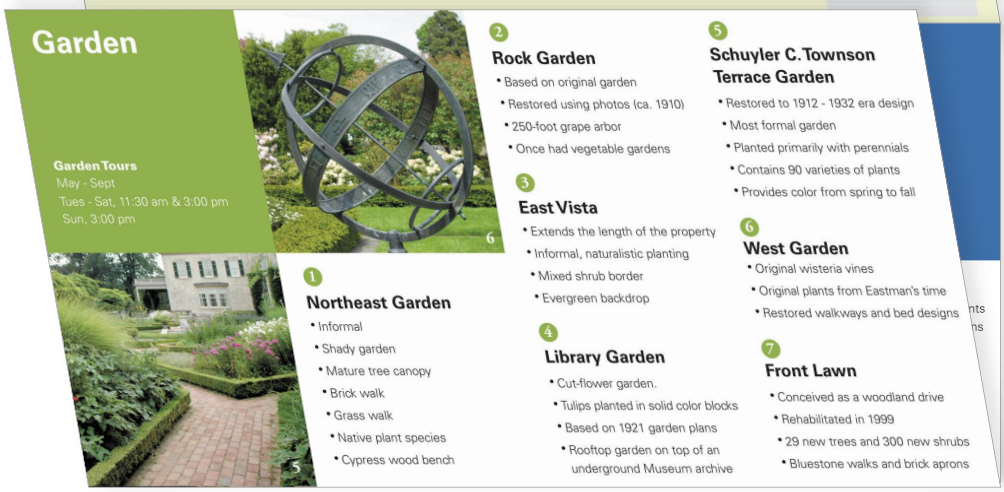
Final Design - Visitor 2 (continued)

Inside Spread
Top Panel



Inside
Front Panel



Final Design - Visitor 2 (continued)

Inside Three-panel Spread

Final Design - Visitor 3

Characteristics

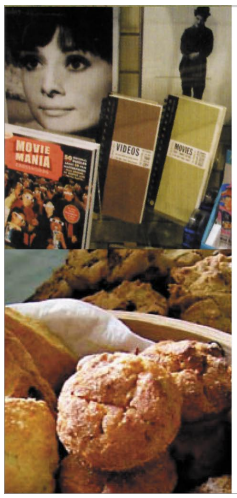
Senior, repeat visitor
Will stay an hour.
Interested in film and galleries
Uses reading glasses.

Design Decisions

Use large type size with extra leading.
Use prose text with 3-6 sentence content descriptions.
Prioritize film and gallery content.

Front Cover

Back Cover



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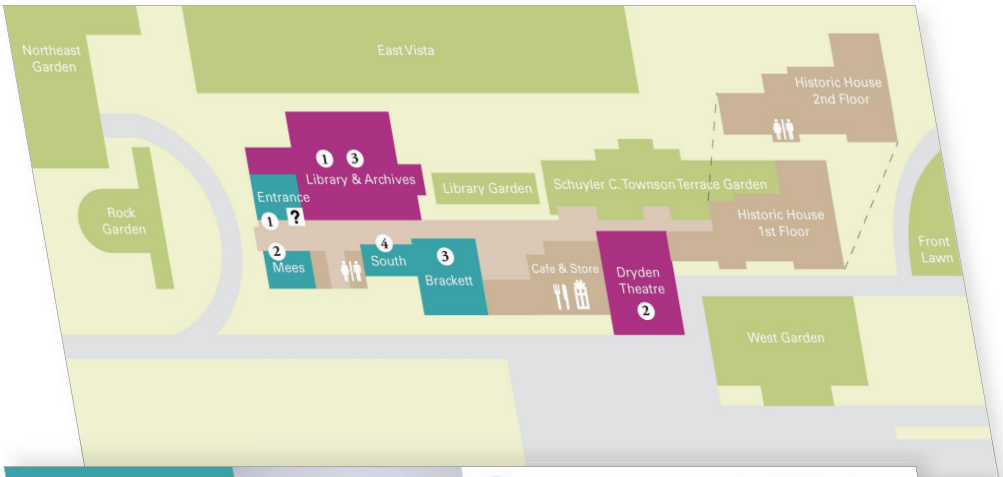
Final Design - Visitor 3 (continued)

Inside Spread
Top Panel



Inside
Front Panel

Final Design - Visitor 3 (continued)

Inside
Three-panel
Spread

Film and Photography

1 Photography Collection

This collection includes more than 400,000 photographs and negatives dating from the invention of photography to the present day. More than 14,000 photographers *are represented in the collection, including virtually all the major figures in the history of the medium. The collection includes original vintage works produced by near every process and printing medium employed.*

***The Gannett Foundation Photographic Study Center**, is open by appointment, Tues - Fri, 10 am to noon and 1 to 4 pm. Please call (585) 271-3361 x459.*

2 Motion Picture Collection

This collection, one of the major moving image archives in the United States, was begun in 1949 by the first curator of film, James Card (1915-2000). His vision, daring and persistence *helped to establish the holdings of over 25,000 titles and a collection of stills, posters and papers with over three million artifacts.*

*The **Film Study Center** is open for questions and researchers, Tues - Fri from 10:00 am - 4:30 pm*

*The **Dryden Theatre** presents screenings all year round, and over the years has hosted hundreds of visiting artists.*

3 Technology Collection

One of the world's largest collections, it contains nineteenth- and twentieth-century objects of photographic technology, including cameras, processing equipment, motion picture devices, and a broad range of early historical accessories.

The collection can be accessed Tues - Fri, 10 am - 5 pm. For appointments, call (585) 271-3361 x369

More to Explore

Garden Tours

From May - September tours are offered *Tues - Sat, 11:30 am & 3 pm and Sun, 3 pm*

House Tours

All year round tours of Eastman's Colonial Revival home are *offered Tues - Sat, 10:30 am & 2 pm, Sun, 2 pm*

George Eastman Archive and Study Center

Learn more about George Eastman at this study center located on the second floor of the house.

Families and Kids

Our various offerings for families include the Garden Tours, Mees Gallery, the Discovery Room and our Store and Cafe.

Thesis Peer Presentation

During the Winter Quarter, a Powerpoint presentation was shared with the design faculty and first-year graphic design MFA students. It included content related to project definition, precedents, research, synthesis and some ideation. (See Appendix F for full presentation.)

For this presentation it was important to introduce new viewers to the two main topics of this design thesis, Usability and Variable Data Print, in a succinct yet comprehensive way. The presentation not only helped form clear summaries of the main topics but prioritized key examples and organized synthesis matrices into presentable formats. This aided with the writing of this thesis document.

MFA Thesis Exhibition

During the early Spring Quarter, an exhibition was installed in the Bevier Gallery on the Rochester Institute of Technology campus. A set of large presentation panels summarized and explained the key components of this thesis and included preliminary ideation and application content. This presentation took near final research and synthesis work and translated it into a condensed yet thorough form that could be understood by viewers new to the material. (See Appendix G for exhibit panels.)

In the process of creating this exhibit and establishing design and content for the system of panels, thesis research became even more clear and connections between topics further solidified. Overall the exhibit helped develop the thesis into ideation and implementation as well as share the content to a broader audience.

MFA thesis exhibit panels in the Bevier Gallery during the opening reception.

After completion of this thesis study, the design concepts and application could be condensed and presented in the form of an article or whitepaper. Potential audiences for these publications would be in the usability and variable data printing fields.

Usability Field

Connecting the two fields of usability and graphic design as explicitly as this thesis has done enlightens both designers and project managers to the impact good design has on usability. The role that customization can play in addressing usability is also explored by this thesis and could be a key aspect of an article published in this area.

Journal of Usability Studies
www.usabilityprofessionals.org/upa_publications/jus/
This peer-reviewed, online publication promotes the practice, research and education of usability engineering. An article published in this journal would reach a large, international audience. The article would focus on the feasibility and value of how design and customization can address usability in printed documents.

User Experience Magazine
www.usabilityprofessionals.org/upa_publications/user_experience/
This magazine publishes articles dealing with the broad field of usability and the user experience. It provides an ideal avenue for sharing this thesis because it would reach industry professionals focused on one of the key topics of this thesis, usability. An article published in this magazine would draw attention to how graphic design and customization can be instrumental in aiding usability.

Printing Industry

The exploration of print customization in this thesis would be relevant to the digital printing industry. As businesses and manufacturers continue to strive for profits and added value for customers, technology plays an important part. Variable data print is one of these important technologies that offers many potential opportunities. The exploration of ways printed materials can be customized from design and usability perspectives pushes the constricted views of the value of variable data print and offers new possibilities. An article about points raised in this theis, like how VDP can help accessibility and usability, would hopefully start this conversation.

Graphic Arts Monthly
www.gammag.com
This magazine covers the printing and graphic arts industries and provides news and trends in printing technology and graphic arts products and services. It would be an an ideal candidate to publish an article showcasing a case study that successfully implemented of some of the customization approaches from this thesis. This article would convey how variable data print can benefit business beyond personalization.

OnDemandJournal
www.ondemandjournal.com
This online site provides news, special reports, whitepapers and case studies about digital printing and on-demand solutions. It offers a unique opportunity to showcase the possibilities VDP can bring to on-demand products. Through a case study or whitepaper related to this thesis study, print executives seeking information about digital printing might be persuaded to implement more complex and meaningful customization.

Outside Evaluation

Overview of Process

The final versions of this thesis application were sent to two professionals, one involved with variable data print and another with museum studies. The goal of this outside evaluation was to solicit feedback that would provide insight into the practical value of this thesis, both in the printing industry and in small and medium sized companies, like museums.

The following project overview, instructions and questions were sent to both Erich Lehman, Prepress Facilities Coordinator at Rochester Institute of Technology, and Kathy Connor, Curator at the George Eastman House. With this information, both persons also received three versions of the final museum guides along with corresponding descriptions of the visitors they were designed for.

Information Provided to Evaluators

Project

These brochures are the product of a thesis study combining graphic design, usability and customized print to create more usable documents on an individual basis. The goal of the thesis study is to push the current boundaries of variable data print and explore ways that graphic design can be employed to aid and increase usability.

Museum guides were selected as the application format for this thesis because they offered a scenario with a large, diverse audience with many physical, cognitive and situational differences. The George Eastman House was selected as the subject matter because the multi-faceted museum provides a scenario where users would have many different interests, goals and needs while visiting.

If actually implemented, users would approach a kiosk at the entrance of the museum and answer a few questions on a touch screen. A customized brochure would be printed out that corresponded to their selections.

Instructions

Please review the three brochure variations and answer the following questions with explanations and specific examples when possible.

Prototype Visitors

Visitor 1

Adult, first-time visitor, interested in house and galleries, will stay the whole afternoon. *Design Approaches: emphasize galleries and house and use short 1-2 sentence prose text.*

Visitor 2

Parent with kids, first-time visitor, interested in aspects that kids will enjoy, will stay a short time. *Design Approaches: emphasize gardens and galleries and use short lists of facts.*

Visitor 3

Senior, repeat visitor, interested in galleries and film aspects, will stay an hour and uses reading glasses. *Design Approaches: emphasize galleries and film and photography and use detailed 3-6 sentence prose text with a large type size.*

Outside Evaluation

Erich Lehman, Prepress Facilities Coordinator

Questions and Answers

Do the brochures employ VDP in a productive and innovative way?

I think the grid you chose lent itself nicely to what you were trying to accomplish. All the brochures were easy to read but still informative within the constraints you set. It is very productive but does not strike me as a blatantly VDP piece. That, to me, is not a bad thing. It's more seamless that way, and the user I think, is more likely to focus on the content.

Do the brochures maintain a consistent design identity across the variations? Do they successfully accommodate typographic changes?

Very much so. My only beef is the identification of photos with numbers. Across the three, one didn't have numbers, and they all had different placements. Now, the average user probably wouldn't see this, but it could lead to design complications (placement of dynamic content boxes, etc).

Overall they seem typographically [sound], although, as I note below, I think the larger type for the elderly visitor leads to less-desirable line breaks in the content.

Do you see any situations where the brochures might pose obvious challenges to pre-press preparation or printing, other than issues related to using a kiosk?

We've spoken about a lot of them previously. You will need consistent placement of some type elements (the numbering ID for the photos) to make sure that the proper dynamic content gets to the proper container. The true answer to this question really depends on which software you use, the experience of the operator programming the variable piece and how you choose to implement this solution at the kiosk

Additional comments or suggestions would also be greatly appreciated.

Overall, I personally don't like the use of repeated numbers, even with alternate colors. I would instead use numbers for one and letters for another or preferably, one set of numbers for the entire map. I would like to see you use consistent placement of the position of the ID numbers in the variable photos.

For the Visitor 2 version, I like the bulleted format for the garden description, because it's more conducive to [lists of facts]. On the inside, however, the bulleted format seems really forced, and I think it would be better as little paragraphs.

For the Visitor 3 version, the inside looks pretty good, but I think the large type on the gallery flap leads to an undesired break, particularly in the Brackett gallery blurb.

Outside Evaluation

Kathy Connor, George Eastman House Curator

Questions and Answers

Do the brochures appropriately portray the Eastman House and reflect the many aspects of the museum?

The brochures do appropriately portray the Eastman House and reflect the many aspects of the museum. All of our photo exhibits (Dar Fur, Dar Fur, Ghosts in the Landscape) are different now from what your brochures reflect. Since we make exhibit changes every two to three months your brochures on demand would have to be constantly updated. That means new photos inserted and if there were sponsors involved with each show, then a sponsor logo or two to be included in the brochure, etc. Garden tours go Memorial Day through Labor Day not May through October.

Do the brochures address individual visitor needs and interests through the use of design and content emphasis changes?

The brochures may reflect different audiences but I think this could be even more effectively done if different pictures and color designs were used both inside and outside of the brochure. If you look at all three [versions] now from the front cover they all look the same. I would change the pink square Visitors Guide section to reflect the audience it was for – Family Guide, Adult Guide, First Time Visitor, etc. Many of our visitors take their guides home with them as souvenirs of their visits, if they are looked at by others it would be good for people to know they were designed for a specific audience.

Do the selected images help reinforce the written text? Does the varying amount of text seem adequate and appropriate for the different visitors?

I liked the color coding on the map and floor plans. They are clearly understood and I think can be easily followed. I would add different pictures in the family guide like a kid eating chocolate cake in the cafe, holding a toy in the shop, smelling the flowers in the garden or making a photogram. Our Garden Vibes programs in the summer are also great activities for kids too. Also, our musicales on Sundays are great for regular visitors or seniors, as well as the classic musical performances by local artists on select Sundays in the house. Different photos would make a big difference in each. Instead of the muffins and books on back cover use an ice cream cone or peanut butter and jelly sandwich for the family guide and a kid item from the shop. If the front covers and back photos were different it would accomplish what you are trying to do even better than the pieces do now.

Additional comments or suggestions would also be greatly appreciated.

I would also add a treasure hunt element to the kids/family guide. We have developed many of these and something like that would keep the kid's attention and allow the parents [to also enjoy other aspects of the museum]. Under the education component of the the Eastman Legacy portion of our website there are some puzzles and kid's activities you may want to incorporate into your brochure.

The larger print is great in the senior brochure. For the family guide I would add more visuals and less text.

Self Evaluation

Building on a strong background in design, hands on experience with variable data print software and a cursory understanding of usability, this thesis provided an outlet to establish common ground for all three of these topics. It is the opinion of the author that the design solution created in this thesis successfully integrates graphic design, usability and variable data print together as a cohesive whole. However, as with any product, it has its strengths, weaknesses and areas of improvement.

Strengths

As mentioned above, the design application for this thesis incorporates all three topics it set out to include. The end goal of usability is achieved through both customization and graphic design. While customization is the overall approach to addressing usability, graphic design determines what and how elements are changed. Graphic design also provides and controls the framework upon which customization is implemented. It structures and orders the variable elements and helps provide a visual unity within a single guide and across many different guide iterations.

Weaknesses

The final thesis application did employ design as a crucial element but it could have further benefited if the underlying grid was even more flexible. The modular approach only allowed for three variable sections, each with fixed content. If the content within each of these sections had more options, or if a greater number of sections were created, then the application could potentially aid usability more. Either way the underlying grid would need to have smaller units and customization decisions would need to deal with more variables. Although every design has different usability requirements in terms of usability (as discussed on page 26), it was apparent that two aspects of usability, error tolerance and learnability, did not play substantial roles in this thesis application and thus were less explored.

Future Refinements

There are a few ways that this thesis application could be improved. First, the application would actually be implemented in variable data print software. The process of doing this would quickly point out potential flaws in design approaches as well as provide new opportunities for customization and addressing usability. Second, the application would be created by a team of production professionals: a graphic designer, a print usability expert, a variable data software operator and a museum staff member familiar with the specific content and visitor needs. Finally, a more comprehensive and focused evaluation would need to be performed. This might be best achieved by pre-selecting a fixed number of people for each version of the guide that match the target users of the guide (as defined on page 57). This evaluation process would also need to allocate adequate time and a procedure that uses a non-biased comparative evaluation of both a control guide and second version of the guide. Combined, this type of evaluation, production team and direct contact with technology would be more efficient and produce a higher quality application.

This thesis began with the intention of making printed documents easier for people to use. It took the developing technology of variable data print and paired it with graphic design problem solving to address usability through customization. The resulting individualization of documents to suit each person's needs proved to have great potential.

Ranging from a survey of each topic to collecting examples of existing customized solutions and factors affecting usability, the research for this thesis covered a lot of ground and unearthed many useful sets of knowledge. Synthesizing these examples and information revealed many unique perspectives and connections between the topics of design, usability and VDP. For example, by pairing graphic design elements to specific user difficulties it was possible to determine concrete ways that simple design decisions can influence the usability of a document. In addition to establishing concrete connections between user needs, design solutions and usability, the levels of variability were mapped out and several conceptual approaches to implementing customization were established. Combining the research and synthesis together with these conceptual approaches helped make the final application a meaningful one. Finally, an evaluation of how the culmination of all this knowledge was implemented, in the form of a customized museum guide, demonstrates that this thesis successfully merged the three topics.

While the final design application and written thesis documentation are successes, each also has its weaknesses. Primarily, the research for this thesis could be more extensive. Perhaps more examples of print customization would have provided a clearer view of what types of information and current changes would be useful to usability. Similarly, the development of a greater number of design systems for varying sizes of formats might have revealed useful insights for alternate design approaches for the thesis application.

Overall, this thesis has collected, analyzed and implemented information that will be useful to anyone involved in projects relating to customization and usability in print. It provides a solid base from which to further explore each related area and some practical approaches to implementing more meaningful customized print projects. Hopefully designers and user advocates alike will see the potential that design and technology have to accommodate each user's individual needs.

In addition to achieving its goal of exploring and integrating the three main topics, this thesis study has also taught and refined many skills. The extensive writing provided an opportunity to strengthen written communication skills and heighten attention to detail. Managing both an extensive work load and conflicting time requirements taught many lessons in large-scale project management. Finally, having developed substantial knowledge and understanding of usability and variable data print, it is now possible to incorporate these factors into design projects with confidence.

Variable Data Print (VDP)
"*The concept of printing that allows for the production of varied or changing elements in a design on the same press run.*" (*FLAAR, 2006)*

This form of digital printing involving a layout with variable content areas that can be customized according to certain rules which then incorporates data from a database or digital asset repository to be integrated into the document just before it gets printed. *(Adobe, 2006)*

Also known as personalized printing/publishing, personalization, customized printing/publishing, database publishing, data driven print, one-to-one communications/publishing. Because VDP is often used to create documents for promoting and selling products and services it is also commonly known as direct marketing and one-to-one marketing. (*Citationsoftware, 2006)*

Usability
The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use." (ISO 9241-11)

Universal Design
An approach to the development of "products and environments that can be used effectively by all people, to the greatest extent possible, without the need for adaptation or specialized design" (North Carolina State University, 1997). It is an inclusive process aimed at enabling all of us to experience the full benefits of the products and environments around us regardless of our ages, sizes or abilities. Also known as *Inclusive* or *Barrier-Free Design. (Tauke, 2006)*

Accessibility
The degree to which products, buildings, services, or information are equally accessible and usable to everyone regardless of physical or mental abilities.

Impairment
Any loss or abnormality of psychological, physiological, or anatomical structure or function.
(Arthur, 1988)

Disability
Any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.
(Arthur and Passini, 1990)

Legibility
Ability of a viewer to see or discern the message displayed.
(Arthur and Passini, 1990)
Information is often conveyed in a way that is too difficult to see clearly enough to understand. (Arthur, 1988)

Readability
Ability of the viewer to comprehend or understand the message displayed.
(Arthur and Passini, 1990)
Words, symbols or patterns that are unfamiliar, or that are used in an ambiguous, confusing, or simply ungrammatical way are, at best, useless and, at worst, misleading and frustrating. (Arthur, 1988)

Variable Data Print

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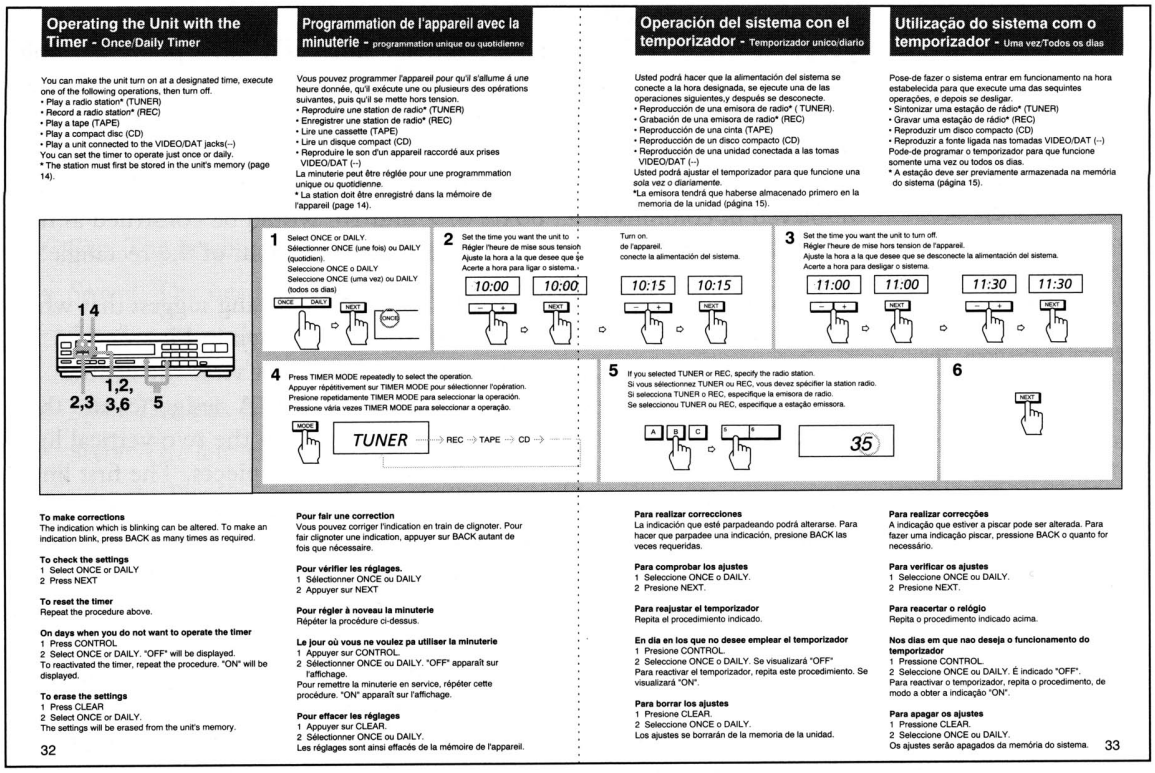
Appendix A
Gestalt Principles



Source

Dynamics in Document Design: Creating Text for Readers, Karen A. Schriver

Appendix B
Multiple Intelligences

The Eight Ways of Learning

Children who are highly:	THINK	LOVE	NEED
Linguistic	in words	reading, writing, telling stories, playing word games	books, tapes, writing tools, paper, diaries, dialogue, discussion, debate, stories
Logical-Mathematical	by reasoning	experimenting, questioning, figuring out logical puzzles, calculating	materials to experiment with, science materials, manipulatives, trips to the planetarium and science museum
Spatial	in images and pictures	designing, drawing, visualizing, doodling	art, LEGOs, video, movies, slides, imagination games, mazes, puzzles, illustrated books, trips to art museums
Bodily-Kinesthetic	through somatic sensations	dancing, running, jumping, building, touching, gesturing	role play, drama, movement, things to build, sports and physical games, tactile experiences, hands-on learning
Musical	via rhythms and melodies	singing, whistling, humming, tapping feet and hands, listening	sing-along time, trips to concerts, music playing at home and school, musical instruments
Interpersonal	by bouncing ideas off other people	leading, organizing, relating, manipulating, mediating, partying	friends, group games, social gatherings, community events, clubs, mentors/apprenticeships
Intrapersonal	in relation to their needs, feelings, and goals	setting goals, meditating, dreaming, planning, reflecting	secret places, time alone, self-paced projects, choices
Naturalist	through nature and natural forms	playing with pets, gardening, investigating nature, raising animals, caring for planet earth	access to nature, opportunities for interacting with animals, tools for investigating nature (e.g., magnifying glass, binoculars)

Source

Multiple Intelligences in the Classroom, Thomas Armstrong

Appendix B (continued)
Multiple Intelligences

The Eight Ways of Teaching

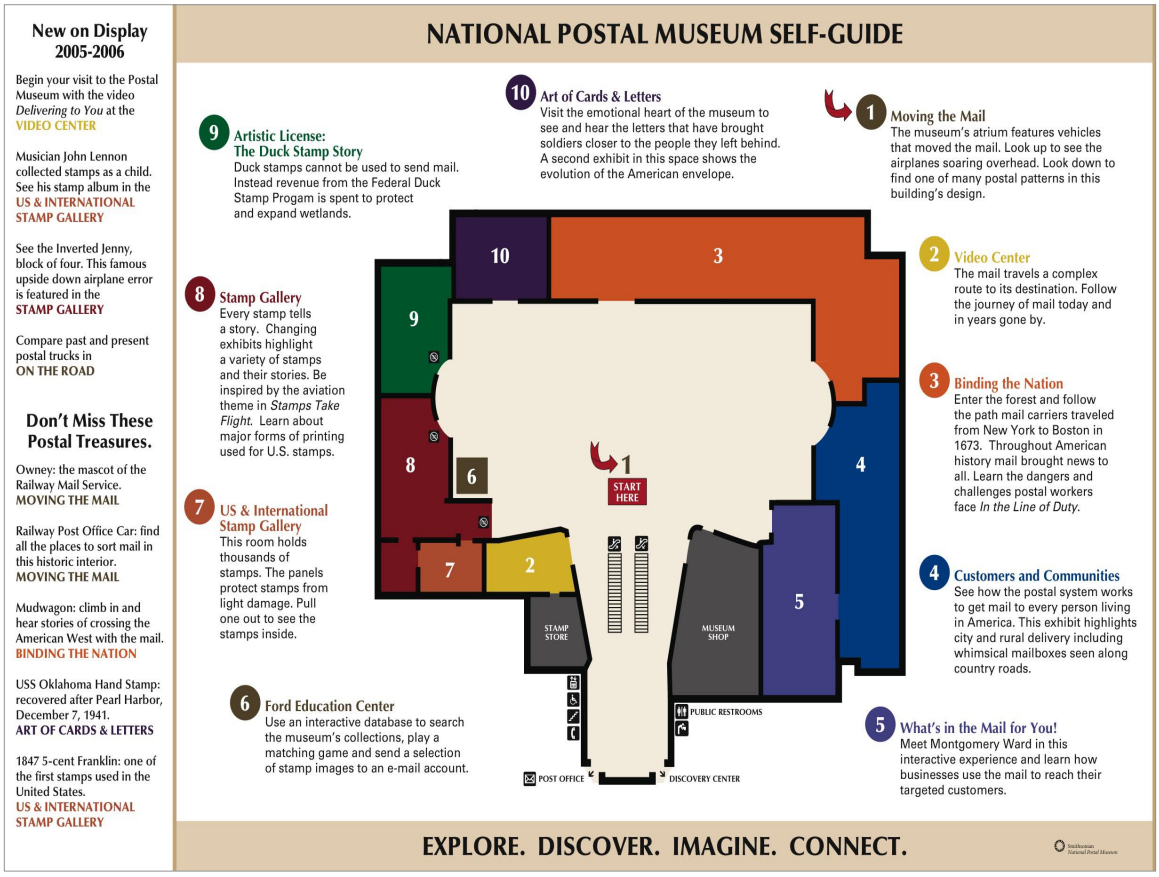
Intelligence	Teaching Activities (examples)	Teaching Materials (examples)	Instructional Strategies
Linguistic	lectures, discussions, word games, storytelling, choral reading, journal writing	books, tape recorders, typewriters, stamp sets, books on tape	read about it, write about it, talk about it, listen to it
Logical-Mathematical	brain teasers, problem solving, science experiments, mental calculation, number games, critical thinking	calculators, math manipulatives, science equipment, math games	quantify it, think critically about it, put it in a logical framework, experiment with it
Spatial	visual presentations, art activities, imagination games, mind-mapping, metaphor, visualization	graphs, maps, video, LEGO sets, art materials, optical illusions, cameras, picture library	see it, draw it, visualize it, color it, mind-map it
Bodily-Kinesthetic	hands-on learning, drama, dance, sports that teach, tactile activities, relaxation exercises	building tools, clay, sports equipment, manipulatives, tactile learning resources	build it, act it out, touch it, get a "gut feeling" of it, dance it
Musical	rhythmic learnings, rapping, using songs that teach	tape recorder, tape collection, musical instruments	sing it, rap it, listen to it
Interpersonal	cooperative learning, peer tutoring, community involvement, social gatherings, simulations	board games, party supplies, props for role plays	teach it, collaborate on it, interact with respect to it
Intrapersonal	individualized instruction, independent study, options in course of study, self-esteem building	self-checking materials, journals, materials for projects	connect it to your personal life, make choices with regard to it, reflect on it
Naturalist	nature study, ecological awareness, care of animals	plants, animals, naturalists' tools (e.g., binoculars), gardening tools	connect it to living things and natural phenomena

Source

Multiple Intelligences in the Classroom, Thomas Armstrong

Appendix C
Sample Museum Guides

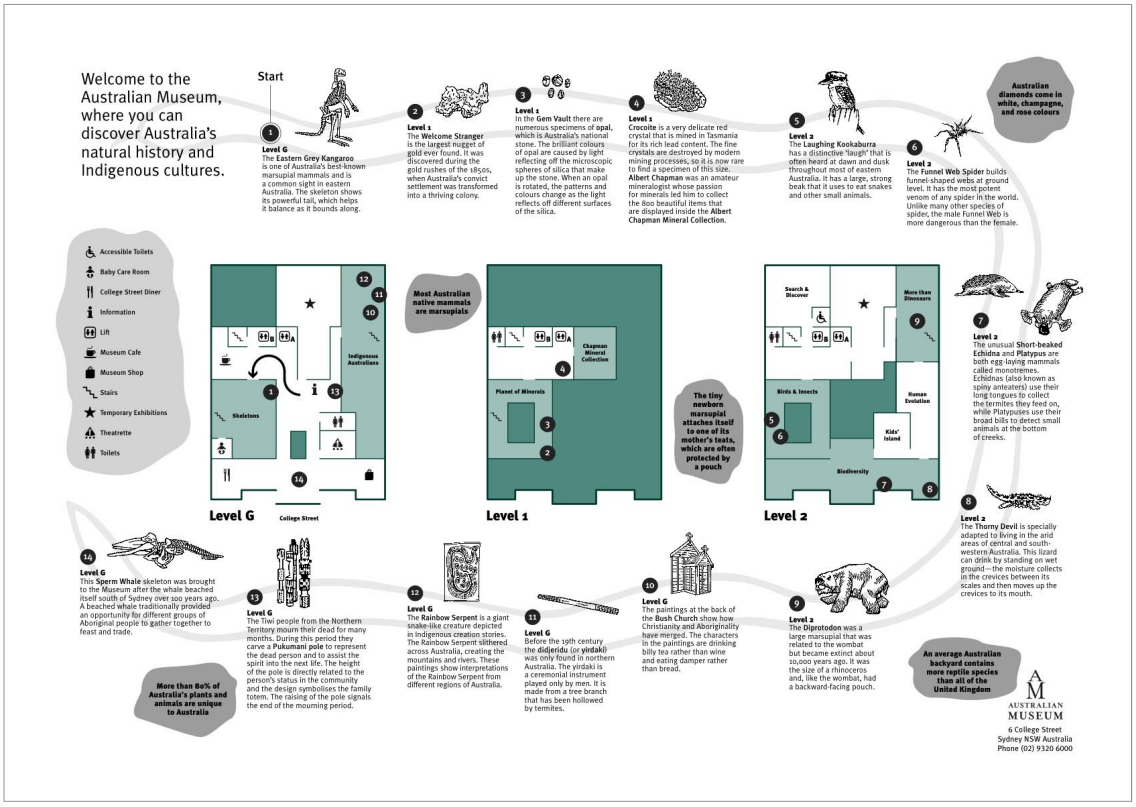
The National Postal Museum, Washington, DC



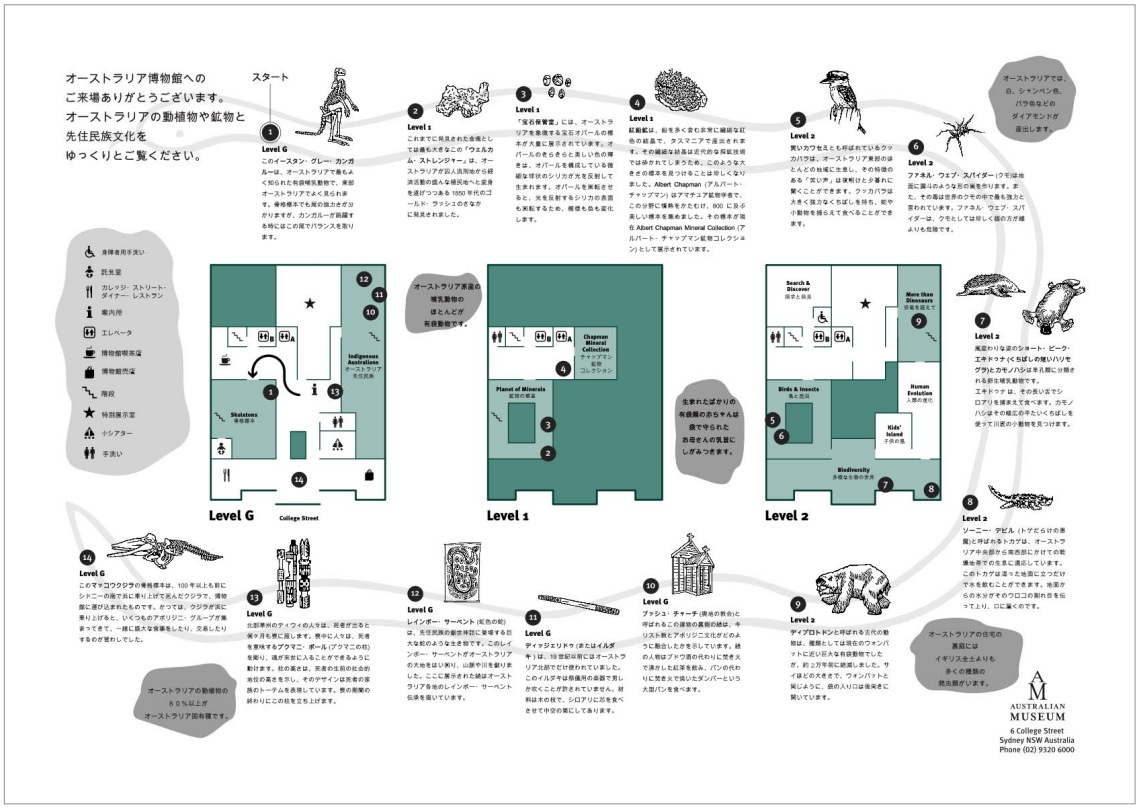
Appendix C (continued)
Sample Museum Guides

The Australian Museum, Sydney, Australia

English version

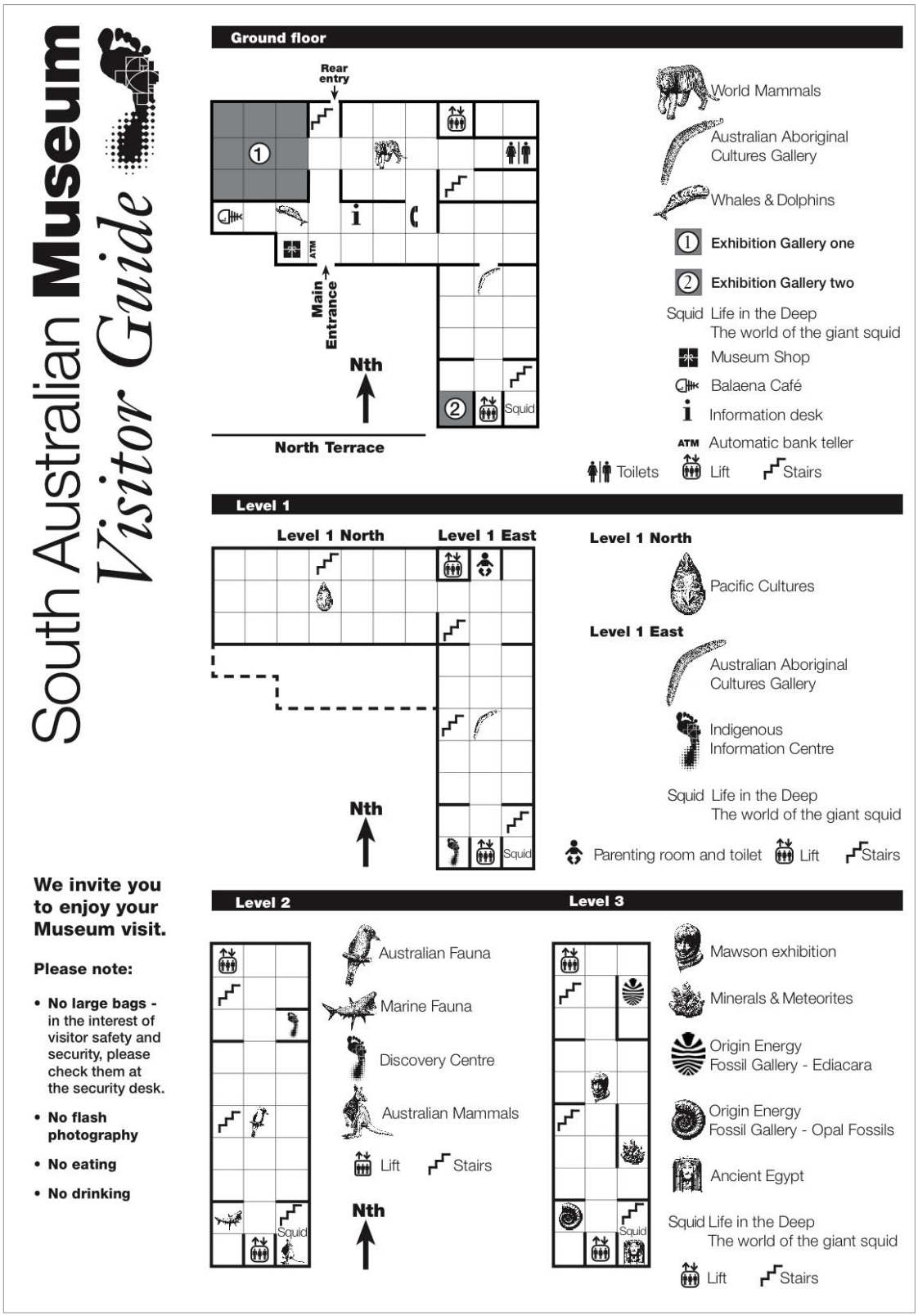


Chinese version



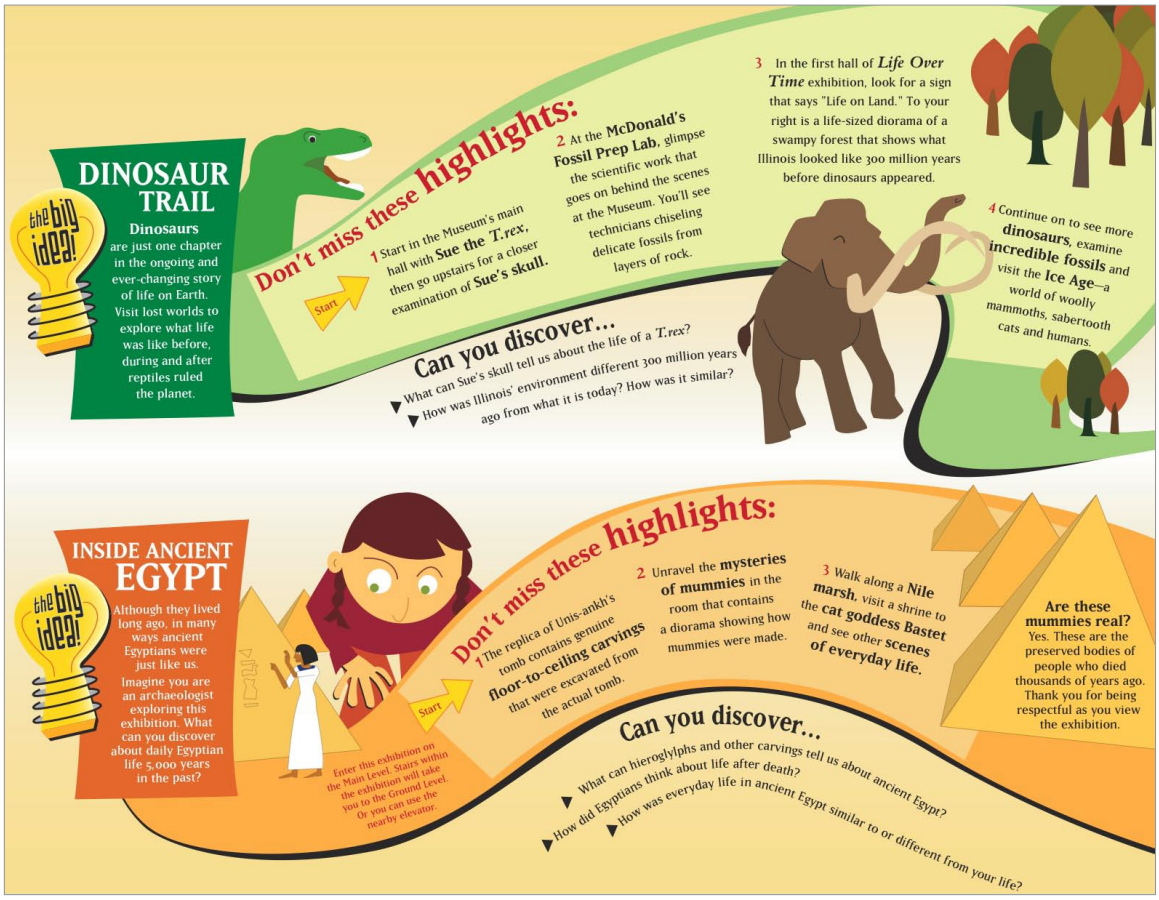
Appendix C (continued)
Sample Museum Guides

The South Australian Museum, Adelaide, Australia



Appendix C (continued)
Sample Museum Guides

The Field Museum, Chicago, IL (Family Adventure Guide, excerpt)



Appendix C (continued)
Sample Museum Guides

Smithsonian Museum of American History, Washington, DC (Family Activity Guide, Spanish version)

Appendix C (continued)
Sample Museum Guides

Smithsonian Museum of American History, Washington, DC (Family Activity Guide, excerpt)

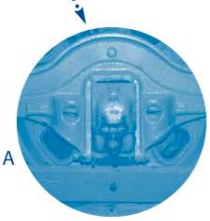
Welcome to Center Market

You've traveled back in time to the year 1900 in Washington, D.C.!

- How many different ways of traveling can you find here?
- How did these foods you see on the platform travel to the market?

Find the vehicle that each wheel belongs to in the exhibition.

Families can travel quickly from their new homes in the suburbs into the city in this vehicle.

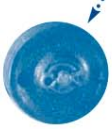


A

Foods from the train station and local farms got delivered by this vehicle.

D

Find this in the video. Some folks traveled this way, but most people walked, as everything was nearby in the city.



E

A hundred years ago, mostly adults rode these and convinced the government to flatten and smooth the roads so riding would be easier.

B

In 1900, there were over three million horses working in the cities. Horse manure had to be cleaned up constantly!

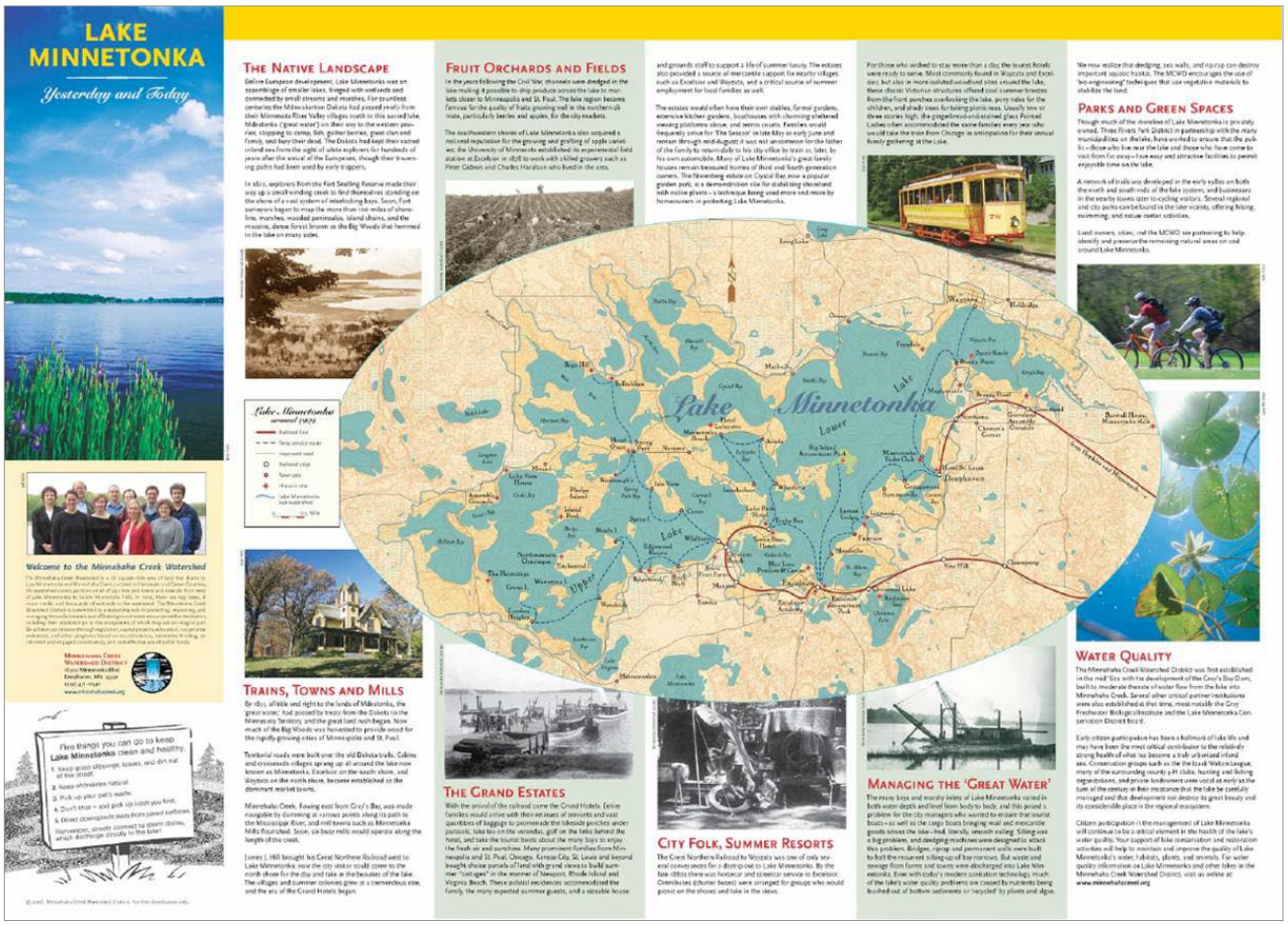
C

Answers: A. trolley, B. bicycle, C. hansom cab, D. wagon, E. roller skates

1

Appendix C (continued)
Sample Museum Guides

The Minnehaha Creek Watershed District, Minnetonka, MN (Historical Map)



Appendix C (continued)
Sample Museum Guides

The Metropolitan Museum of Art, New York, NY (Kid's Guide)

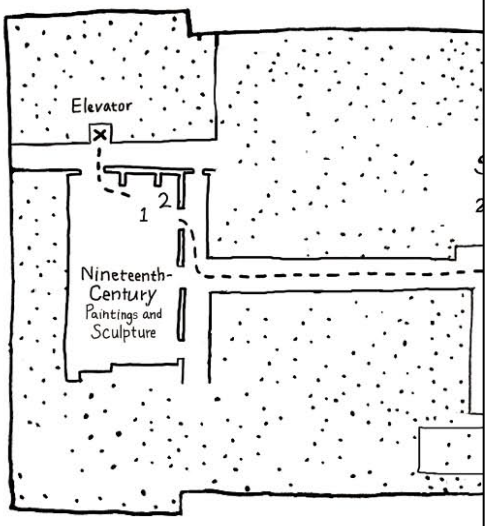
Now spot Claude Monet's *Haystacks (Effect of Snow and Sun)* in a nearby gallery. 2

Practice makes perfect. Maybe that's what the artist, Claude Monet, was thinking. In about a year and a half, he painted more than thirty versions of the haystacks near his house.

- Why do you think he painted so many?

During the winter, Monet commented, " . . . the sun sets so fast I cannot follow it." In this painting, the sunlight is so brilliant you almost need sunglasses.

- How has the artist made it seem so bright?
- Monet was looking for what he called "instantaneity" when he painted. What do you think that means? (Think about the word "instant.")

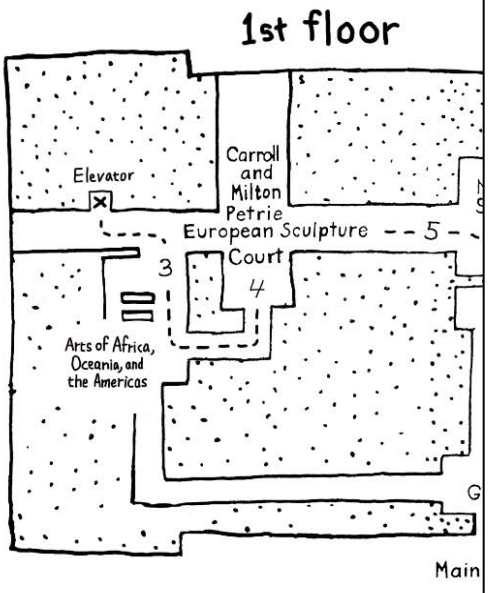


Take the elevator at the end of the corridor down to the first floor. Turn left and enter the Arts of Africa, Oceania, and the Americas galleries on your right. Find the 8th-century *Cylindrical Vessel with Throne Scene* from Guatemala in a glass case against the left wall. 3

What's cold weather without hot cocoa? It seems that we're not the only ones who like to warm up with a steaming chocolaty drink—the Maya beat us to it by more than a thousand years. Plenty of evidence has been found in tombs that tells us that the Maya consumed chocolate.

- Can you find the picture of a vessel (cup) on the actual vessel? (It's on the ground, in between the two seated figures.)

The foamy liquid you see on top of the illustrated cup may be cacao, a kind of chocolate drink—and the actual cup you're looking at may have been used for cacao. It's a cup on a cup—got that?



Appendix C (continued)
Sample Museum Guides

The National Gallery of Art, Washington, DC

LESS THAN AN HOUR?

West Building Highlights

www.nga.gov

If you only have a short time to visit the National Gallery of Art, here are twelve must-see works. Laminated guides with commentaries are available throughout the Gallery. Some objects may be temporarily off view.

A Leonardo da Vinci, *Ginevra de' Benci* (obverse), c. 1474/1478, Gallery 6

B Florentine 15th or 16th Century, probably after a model by Andrea del Verrocchio and Orsino Benintendi, *Lorenzo de' Medici*, 1478/1521, Gallery 7

C Giovanni Bellini and Titian, *The Feast of the Gods*, 1514/1529, Gallery 17

D Raphael, *The Alba Madonna*, c. 1510, Gallery 20

E Orazio Gentileschi, *The Lute Player*, c. 1612/1620, Gallery 29

F Jan van Eyck, *The Annunciation*, c. 1434/1436, Gallery 39

G Sir Peter Paul Rubens, *Daniel in the Lions' Den*, c. 1614/1616, Gallery 45

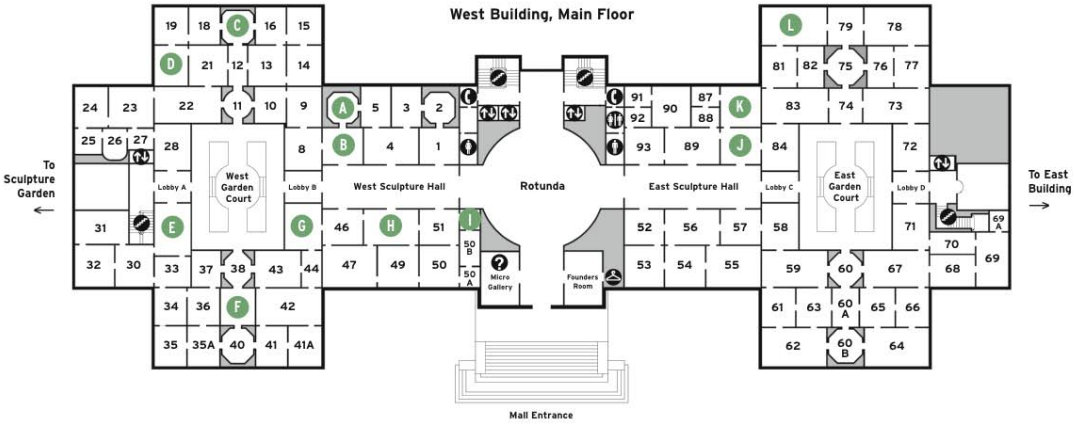
H Rembrandt van Rijn, *Self-Portrait*, 1659, Gallery 48

I Johannes Vermeer, *A Lady Writing*, c. 1665, Gallery 50C

J Claude Monet, *Rouen Cathedral, West Façade, Sunlight*, 1894, Gallery 85

K Edouard Manet, *The Railway*, 1873, Gallery 86

L Paul Cézanne, *The Peppermint Bottle*, 1893/1895, Gallery 80



Appendix C (continued)
Sample Museum Guides

The National Gallery of Art, Washington, DC

English gallery guide

CONSTABLE AND TURNER

Constable and Turner: British Landscapes of the Early 1800s

The landscape painters Turner and Constable were influential exponents of romanticism, an artistic movement of the late 1700s to mid-1800s that emphasized an emotional response to nature. Turner, who traveled extensively, often infused his dramatic seascapes and landscapes with literary or historical allusions. Constable, who never left England, preferred more straightforward depictions of placid rural scenery.

Working in the studio from sketches and his imagination, Turner blended his oil paints in fluid layers of translucent color, called glazes. Constable, sometimes painting directly outdoors, applied flickering touches of thick, opaque oils. Despite their differences in temperament and technique, Turner and Constable evoke the same worship of nature that imbues the literature of their contemporaries, the romantic poets Wordsworth, Coleridge, Byron, Shelley, and Keats.

John Constable
British, 1776–1837

Wivenhoe Park, Essex, 1816

This picture, exhibited at Britain's Royal Academy in 1817, demonstrates Constable's wish to be "a natural painter" because it was created almost entirely out-of-doors. During August and September 1816, the artist documented this country estate of old family friends and recorded his progress in letters to his fiancée. (The commission financed their wedding.)

Centered in the panoramic design, the red brick manor house stands out by reason of its warm color in an otherwise cool scheme of blues, greens, and grays. Constable wrote about the "great difficulty" of incorporating the thatch-roofed deer barn. To add this requested motif, he cleverly sewed about an inch of extra fabric to the canvas at the far right. Then, in order to restore the composition's symmetrical balance, he stitched a similar strip to the left side, where he showed the owners' daughter, Mary Rebow, driving a donkey cart.

Oil on canvas, .581 x 1.012 m (22 ⅞ x 39 ¾ in.)
Widener Collection 1942.9.10

John Constable

Salisbury Cathedral from Lower Marsh Close, 1820

Constable frequently depicted Salisbury's famous spire, which, at 404 feet, is the tallest in England. Piercing the air, the lofty steeple attracts attention to the atmosphere around it. One of Constable's main interests was portraying the weather—a process he called "skying."

When the Gothic cathedral was finished in the 1300s, its grounds were walled or enclosed; this Close forms a lush, marshy park. The couple strolling through the Close's avenue of elms may be John Fisher, the Archbishop of Salisbury, and his wife. Their nephew, an archdeacon and art patron, was Constable's closest friend. This personal souvenir, kept by the artist, freshly observes the sunshine dappling the lawn. With long shadows falling from the west, the time is early evening. The canvas was executed spontaneously on the spot, and its brown underpainted layer is still visible beneath the trees.

Oil on canvas, .730 x .914 m (28 ¾ x 35 ⅞ in.)
Andrew W. Mellon Collection 1937.1.108

Joseph Mallord William Turner
British, 1775–1851

The Junction of the Thames and the Medway, 1807

Turner, who earned an early reputation for producing accurate topographical views, opened his own private sales gallery, where he exhibited this turbulent seascape. Based on notes in the artist's sketchbooks, the scene is the wide mouth of the Thames joining the North Sea, where the smaller River Medway further churns the waves. To the south, the town on the far shore is the seaport of Sheerness.

To heighten the storm's impact, Turner artfully manipulated the lighting in this composition. The sails at the right, for instance, are brilliantly silhouetted against the dark clouds. In actuality, however, the sun is obscured high in the sky behind the thunderheads, making it impossible for sunbeams to strike those ships from the side.

Oil on canvas, 1.088 x 1.437 m (42 ¾ x 56 ⅝ in.)
Widener Collection 1942.9.87

Joseph Mallord William Turner

Mortlake Terrace, 1827

A fashionable London suburb, Mortlake Terrace lies next to the Royal Botanical Gardens at Kew, visible here on the distant bend of the River Thames. This is one of a pair of views commissioned by the owner of a town house, The Limes, named after the magnificent lime trees lining its terrace. Both scenes daringly portray the blazing disk of the sun itself, which here flashes a reflection from the stone parapet.

The companion piece, now in New York City's Frick Collection, depicts the house at sunrise. Reversing the view, this picture looks west over the garden at sunset after the children have abandoned their toys. A black dog barks at the Lord Mayor's flag-decked barge. This dark accent, which enhances the summer evening's hazy paleness, was a last-minute addition. Just before the Royal Academy show opened in 1827, Turner cut the dog out of paper, stuck it onto the wet varnish, and touched it up with highlights and a collar.

Oil on canvas, .921 x 1.222 m (36 ¼ x 48 ⅛ in.)
Andrew W. Mellon Collection 1937.1.109

PLEASE RETURN THIS GUIDE

Equivalent French version

FRANÇAIS

GALERIE 57

Constable et Turner
Paysages anglais du début du XIXème siècle

Les paysagistes Turner et Constable jouèrent un rôle important dans le développement du romantisme, un courant artistique qui, de la fin du XVIIIème siècle au milieu du XIXème, s'attacha à traduire l'émotion de l'homme devant la nature. Turner, qui voyageait beaucoup, introduisait souvent dans ses marines et ses paysages grandioses des références historiques et littéraires. Constable, qui ne quitta jamais l'Angleterre, préférait peindre des scènes simples et paisibles de la campagne.

Travaillant dans son atelier à partir d'esquisses que son imagination transformait, Turner étendait la peinture à l'huile en fines couches de couleur transparente, appelées glacis. Constable, qui peignait parfois directement en plein air, appliquait des touches scintillantes de peinture épaisse. Malgré leurs différences de tempérament et de technique, Turner et Constable expriment dans leurs œuvres un même culte de la nature, semblable à celui qui imprègne la littérature de leur époque, la poésie romantique de Wordsworth, Coleridge, Byron, Shelley et Keats.

Des paysages de Constable et de Turner sont exposés dans les Galeries 57 et 58 selon une sélection qui change parfois. Vous pouvez emporter ce guide dans la galerie voisine pour le consulter. PRIÈRE DE RAPPORTER CE GUIDE DANS LA GALERIE 57.

John Constable
Anglais, 1776–1837
Wivenhoe Park, Essex, 1816

Huile sur toile, 0,561 x 1,012 m. Collection Widener 1942.9.10

Ce tableau, exposé à l'Académie Royale d'Angleterre en 1817, montre combien Constable souhaitait être un peintre "de la nature" : il fut exécuté presque entièrement en plein air. L'artiste peignit cette propriété appartenant à de vieux amis de la famille pendant les mois d'août et de septembre 1816, tout en faisant part de ses progrès dans ses lettres à sa fiancée. (C'est cette commande qui paya leur mariage.)

Située au centre d'une vue panoramique, la demeure en briques rouges ressort par ses couleurs chaudes sur un ensemble de tons froids, bleu, vert et gris. Constable décrivit la "grande difficulté" qu'il eut à incorporer l'étable au toît de chaume. Pour ajouter ce détail qui lui fut imposé, il eut l'idée ingénieuse de coudre environ trois centimètres de toile supplémentaire du côté droit du tableau. Puis, afin de préserver la symétrie de la composition, il cousit une bande identique à gauche, sur laquelle il peignit la fille des propriétaires, Mary Rebow, assise dans une charette tirée par un âne.

La Cathédrale de Salisbury vue de l'enclos de Lower Marsh, probablement vers 1825

Huile sur toile, 0,730 x 0,914 m. Collection Andrew W. Mellon 1937.1.108

Constable peignit souvent la célèbre flèche de Salisbury, la plus haute d'Angleterre. Perçant l'air de ses 123 mètres, ce clocher élégant attire l'attention sur l'atmosphère qui l'entoure. Constable s'intéressait particulièrement à la représentation de l'air et du temps.

Lorsque la cathédrale gothique fut achevée au XIVème siècle, le terrain qui l'entourait fut ceint d'un mur ; cet enclos forme un parc marécageux à la végétation luxuriante. Le couple qui se promène dans l'allée plantée d'ormes est peut-être John Fisher, archevêque de Salisbury, et sa femme. Leur neveu, un archidiacre et mécène, était le meilleur ami de Constable, qui garda ce tableau comme souvenir personnel. Les rayons du soleil à l'ouest illuminent la pelouse à travers les arbres. D'après la longueur des ombres la scène se passe en début de soirée. Cette toile pleine de fraîcheur fut peinte rapidement, sur le motif ; la couche brune de préparation est encore visible sous le feuillage des arbres.

Joseph Mallord William Turner
Anglais, 1775–1851
Le confluent de la Tamise et de la Medway, vers 1805/1808

Huile sur toile, 1,088 x 1,437 m. Collection Widener 1942.9.87

Turner, qui s'était acquis très tôt une réputation pour la précision de ses vues topographiques, ouvrit sa propre galerie où il exposa cette marine tourmentée. Exécutée à partir de notes dans ses carnets de croquis, la scène représente l'embouchure de la Tamise dans la Mer du Nord, à l'endroit où la Medway, plus petite, se jette aussi, créant des turbulences. Au sud, la ville que l'on aperçoit sur le rivage lointain est le port maritime de Sheerness.

Pour accentuer l'effet de l'orage, Turner a habilement joué avec l'éclairage. Les voiles de droite, par exemple, se distinguent par leur luminosité sur les nuages sombres. En réalité, cependant, le soleil est caché haut dans le ciel derrière les nuées noires ; il est donc impossible que des rayons frappent ces navires de côté.

Mortlake Terrace, vers 1826

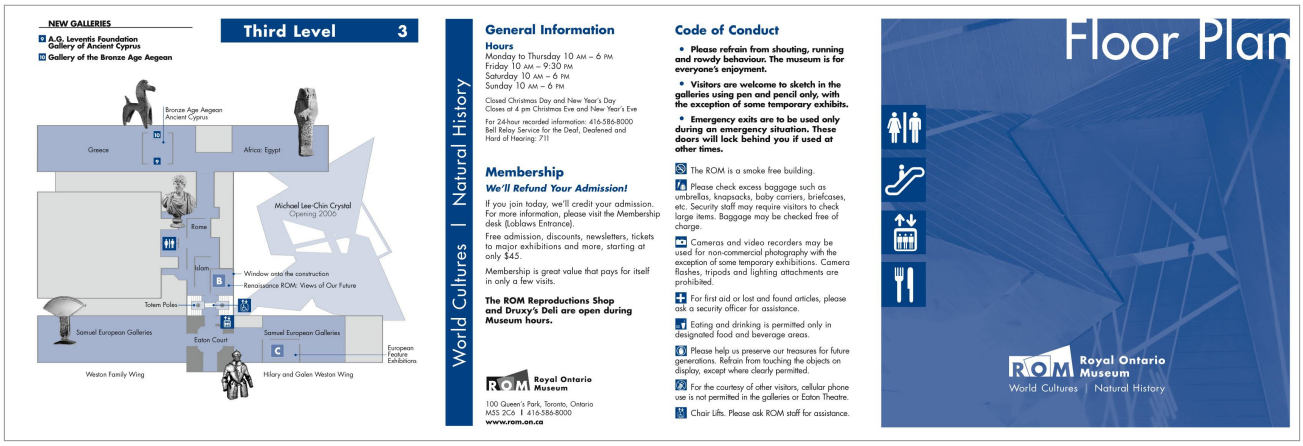
Huile sur toile, 0,921 x 1,222 m. Collection Andrew W. Mellon 1937.1.109

Mortlake Terrace, une banlieue londonienne à la mode, se trouve près des Jardins Botaniques Royaux de Kew que l'on aperçoit au loin sur un tournant de la Tamise. Ce tableau est une de deux vues commandées par le propriétaire des Tilleuls, une maison appelée ainsi à cause d'une magnifique rangée de tilleuls qui bordait sa terrasse. Les deux tableaux montrent audacieusement le disque éblouissant du soleil dont les rayons se réfléchissent ici sur la balustrade en pierre.

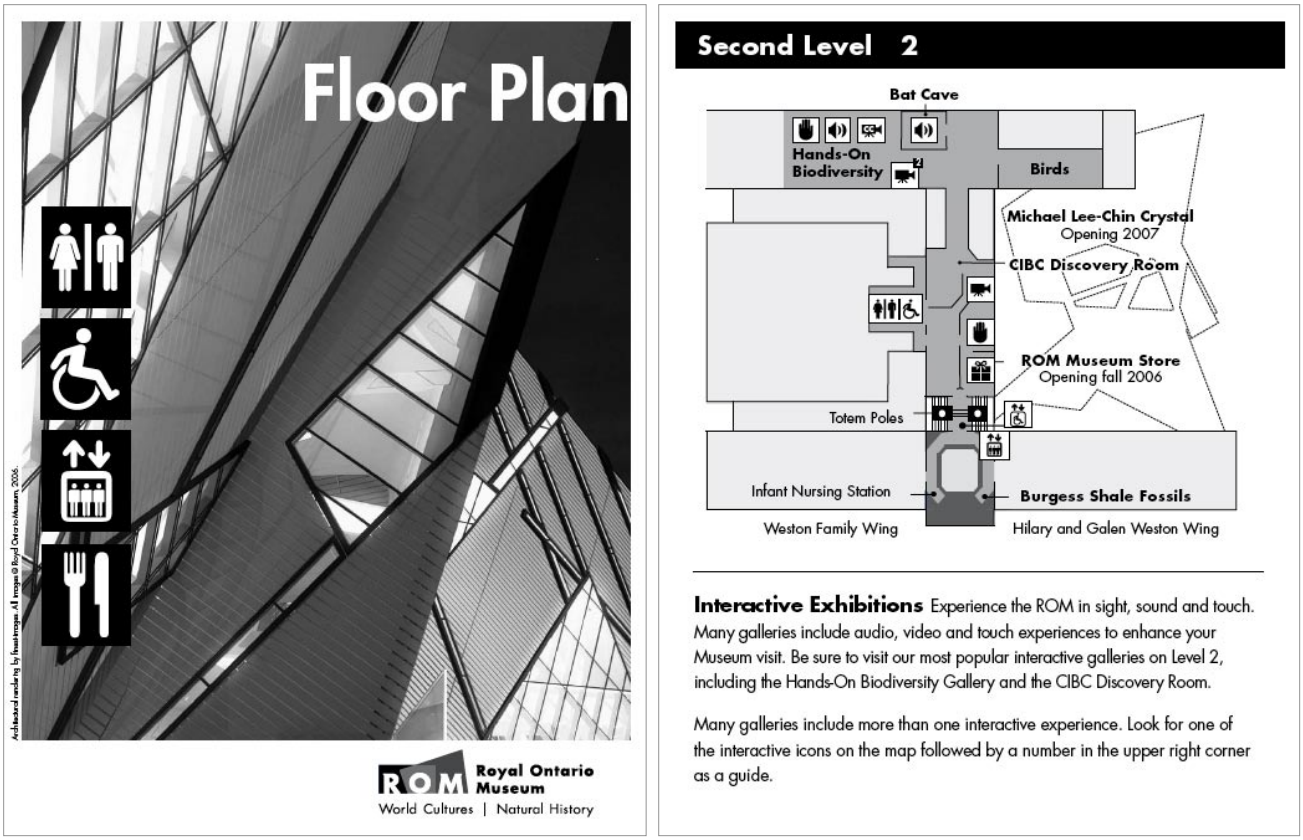
Le pendant, qui se trouve à la Frick Collection à New York, représente la maison au soleil levant. Ici la vue est inversée, montrant vers l'ouest le jardin au crépuscule après que les enfants ont abandonné leurs jouets. Un chien noir aboie en direction de la péniche de Lord Mayor sur le pont de laquelle flotte un drapeau. Cette note foncée, qui fait ressortir la pâleur

Appendix C (continued)
Sample Museum Guides

Royal Ontario Museum, Toronto, Canada



Normal guide



Large print version

Appendix D
Layout Adjustment Exercises

Original

Library Garden
The library garden is a 1990 adaptation of DeForest's 1921 cut-flower garden. The double row of arborvitae outlines the original central axis with spring-flowering tulips planted in solid blocks of red, white, and purple.

Rock Garden
Restoration of the rock garden was completed in 1992 and was based on historical photographs (ca. 1910) of the original garden. The 250-foot grape arbor was Alling S. DeForest's 1902 grounds plans.

West Garden
The west garden was designed and built by Claude Bragdon in 1917. The wisteria vines on the garden house are original. The three perimeter garden borders and four central beds were planted with perennials and bulbs during Eastman's time.

Northeast Garden
The northeast garden, established during the North Property Rehabilitation Project, is the shadiest, most informal garden on the grounds. A brick walk leads from the grape arbor to the pedestrian gate of the reconstructed University Avenue fence.

East Vista
The east vista, which extends the length of the property from East Avenue to University Avenue, was designed by landscape architect Alling S. DeForest with an informal, naturalistic planting along the eastern border.

Front Lawn
Rehabilitation of the front lawn on East Avenue began in 1996 and was completed in fall 1999. New plantings include 29 trees (maples, dogwood, and hickory) and more than 300 ornamental shrubs (viburnum, forsythia, jet bead, spireas).

Appendix D (continued)
Layout Adjustment Exercises

Typographic Adjustments

Library Garden
The library garden is a 1990 adaptation of DeForest's 1921 cut-flower garden. The double row of arborvitae outlines the original central axis with spring-flowering tulips.

Rock Garden
Restoration of the rock garden was completed in 1992 and was based on historical photographs (ca. 1910) of the original garden.

West Garden
The west garden was designed and built by Claude Bragdon in 1917. The wisteria vines on the garden house are original.

Northeast Garden
The northeast garden, established during the North Property Rehabilitation Project, is the shadiest, most informal garden on the grounds.

East Vista
The east vista, which extends the length of the property from East Avenue to University Avenue, was designed by landscape architect Alling S. DeForest.

Front Lawn
Rehabilitation of the front lawn on East Avenue began in 1996 and was completed in fall 1999 including 29 new tree plantings.

Appendix D (continued)
Layout Adjustment Exercises

Prioritized Content

Library Garden

The library garden is a 1990 adaptation of DeForest's 1921 cut-flower garden. The double row of arborvitae outlines the original central axis with spring-flowering tulips planted in solid blocks.

Rock Garden
Restoration of the rock garden was completed in 1992 and was based on historical photographs (ca. 1910) of the original garden. The 250-foot grape arbor was Alling S. DeForest's 1902 grounds plans.

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Northeast Garden
The northeast garden, established during the North Property Rehabilitation Project, is the shadiest, most informal garden on the grounds. A brick walk leads from the grape arbor to the pedestrian gate of the reconstructed University Avenue fence.

East Vista

The east vista, which extends the length of the property from East Avenue to University Avenue, was designed by landscape architect Alling S. DeForest with an informal, naturalistic planting.

Front Lawn
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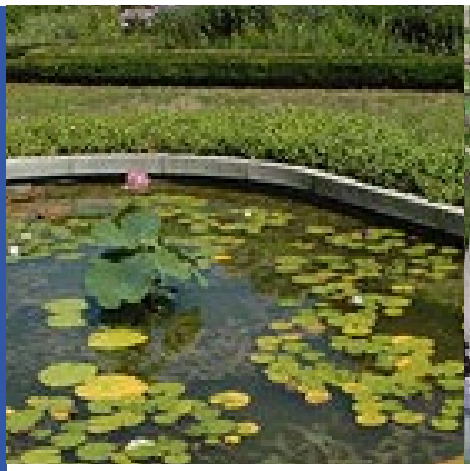
Appendix D (continued)
Layout Adjustment Exercises

Clear Visual Hierarchy



Library Garden
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East Vista
The east vista, which extends the length of the property from East Avenue to University Avenue, was designed by landscape architect Alling S. DeForest with an informal, naturalistic planting along the eastern border.

North Garden
The northeast garden, established during the North Property Rehabilitation Project, is the shadiest, most informal garden on the grounds. A brick walk leads from the grape arbor to the pedestrian gate of the reconstructed University Avenue fence.

West Garden
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Front Lawn
Rehabilitation of the front lawn on East Avenue began in 1996 and was completed in fall 1999. New plantings include 29 trees (maples, dogwood, and hickory) and more than 300 ornamental shrubs (viburnum, forsythia, jet bead, spireas).

Rock Garden
Restoration of the rock garden was completed in 1992 and was based on historical photographs (ca. 1910) of the original garden. The 250-foot grape arbor was Alling S. DeForest's 1902 grounds plans.

Appendix D (continued)
Layout Adjustment Exercises

Additional Typographic Elements

1

Library Garden
The library garden is a 1990 adaptation of DeForest's 1921 cut-flower garden. The double row of arborvitae outlines the original central axis with spring-flowering tulips planted in solid blocks of red, white, and purple.

Rock Garden
Restoration of the rock garden was completed in 1992 and was based on historical photographs (ca. 1910) of the original garden. The 250-foot grape arbor was Alling S. DeForest's 1902 grounds plans.

2

West Garden
The west garden was designed and built by Claude Bragdon in 1917. The wisteria vines on the garden house are original. The three perimeter garden borders and four central beds were planted with perennials and bulbs during Eastman's time.

Northeast Garden
The northeast garden, established during the North Property Rehabilitation Project, is the shadiest, most informal garden on the grounds. A brick walk leads from the grape arbor to the pedestrian gate of the reconstructed University Avenue fence.

3

East Vista
The east vista, which extends the length of the property from East Avenue to University Avenue, was designed by landscape architect Alling S. DeForest with an informal, naturalistic planting along the eastern border.

Front Lawn
Rehabilitation of the front lawn on East Avenue began in 1996 and was completed in fall 1999. New plantings include 29 trees (maples, dogwood, and hickory) and more than 300 ornamental shrubs (viburnum, forsythia, jet bead, spireas).

Appendix D (continued)
Layout Adjustment Exercises

Additional Content Formatting

Library Garden

- 1990 adaptation of DeForest's 1921 cut-flower garden
- Double row of arborvitae outlines the original central axis
- Spring-flowering tulips planted in solid blocks

Rock Garden

- Restoration of the rock garden was completed in 1992
- Based on historical photographs ca.1910
- 250-foot grape arbor was in DeForest's 1902 plans

West Garden

- Designed and built by Claude Bragdon in 1917
- Wisteria vines on the garden house are original
- Perimeter gardens were planted during Eastman's time

Northeast Garden

- Established during North Property Rehabilitation Project
- The shadiest, most informal garden on the grounds
- Brick walk leads from grape arbor to the pedestrian gate

East Vista

- Extends the property length from East to University Ave
- Designed by landscape architect Alling S. DeForest
- An informal, naturalistic planting along the eastern border

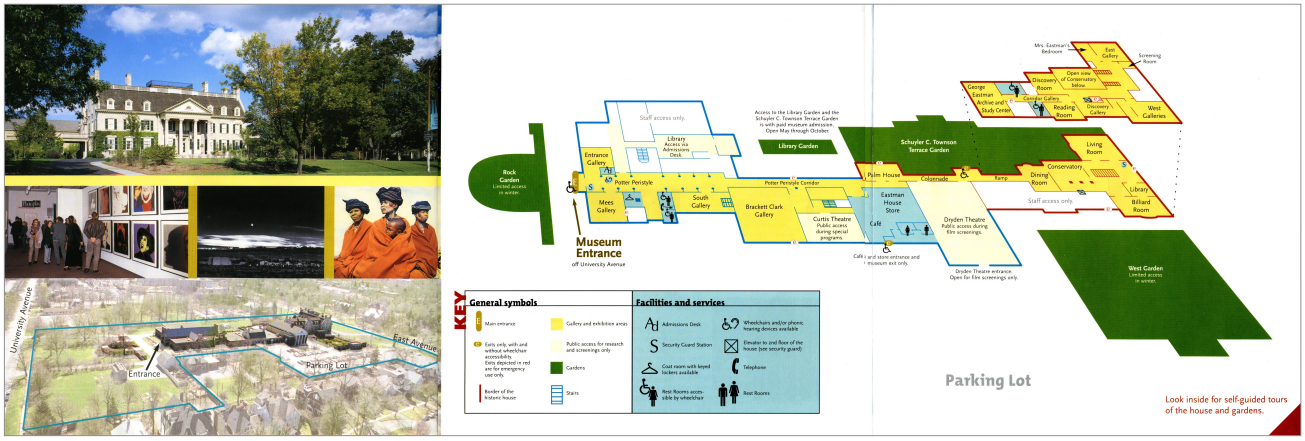
Front Lawn

- Rehabilitation began in 1996 and was completed in 1999
- New plantings include 29 trees
- More than 300 ornamental shrubs

Appendix E
Existing George Eastman House Guide

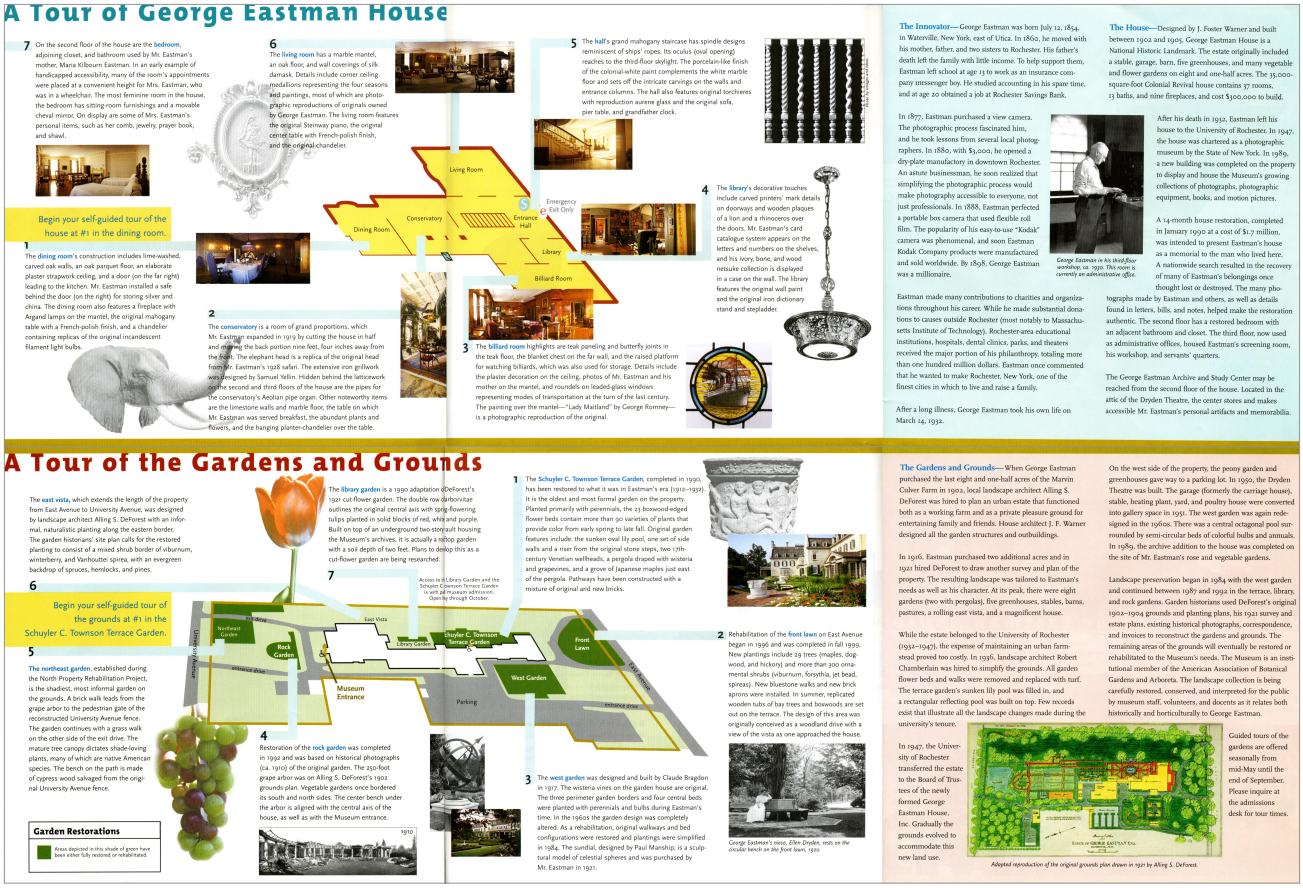
Front Cover

Inside Front Cover



Folded Over Inside Three-panel Spread

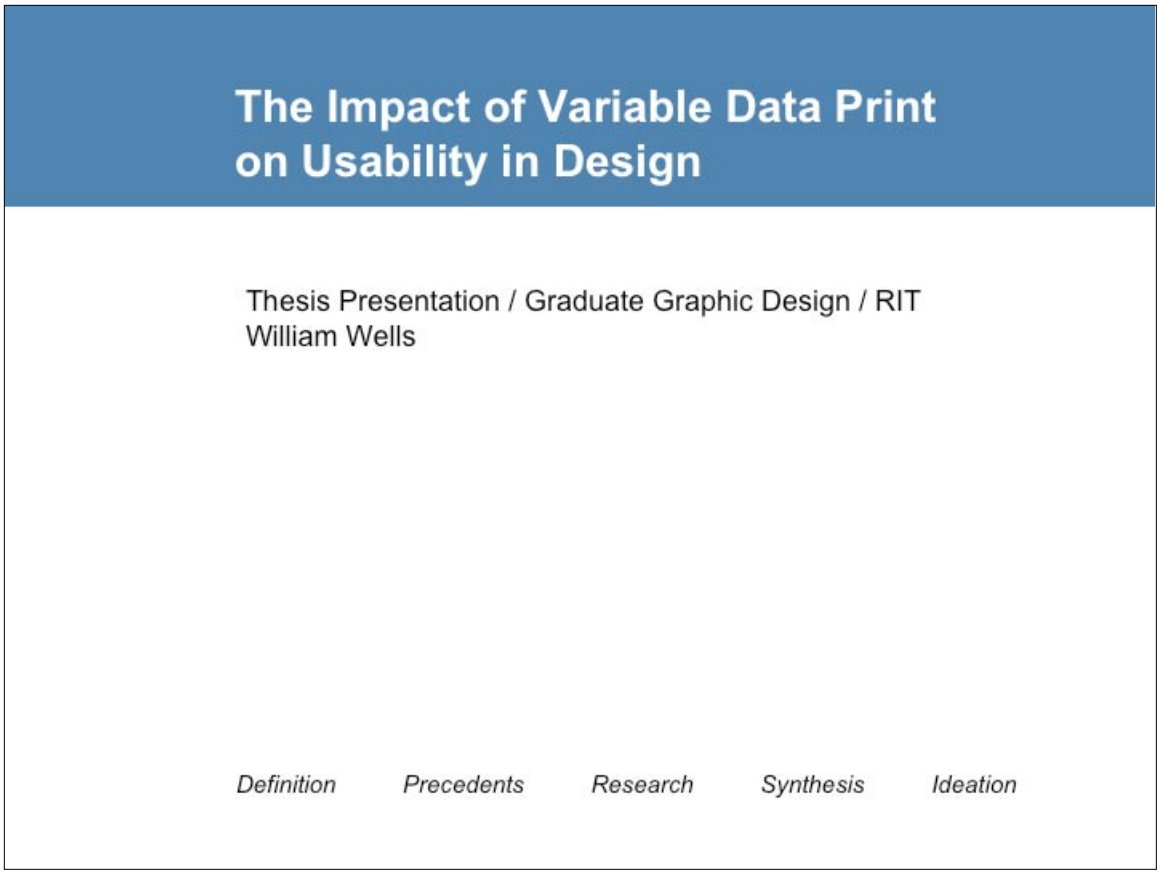
Appendix E (continued)
Existing George Eastman House Guide

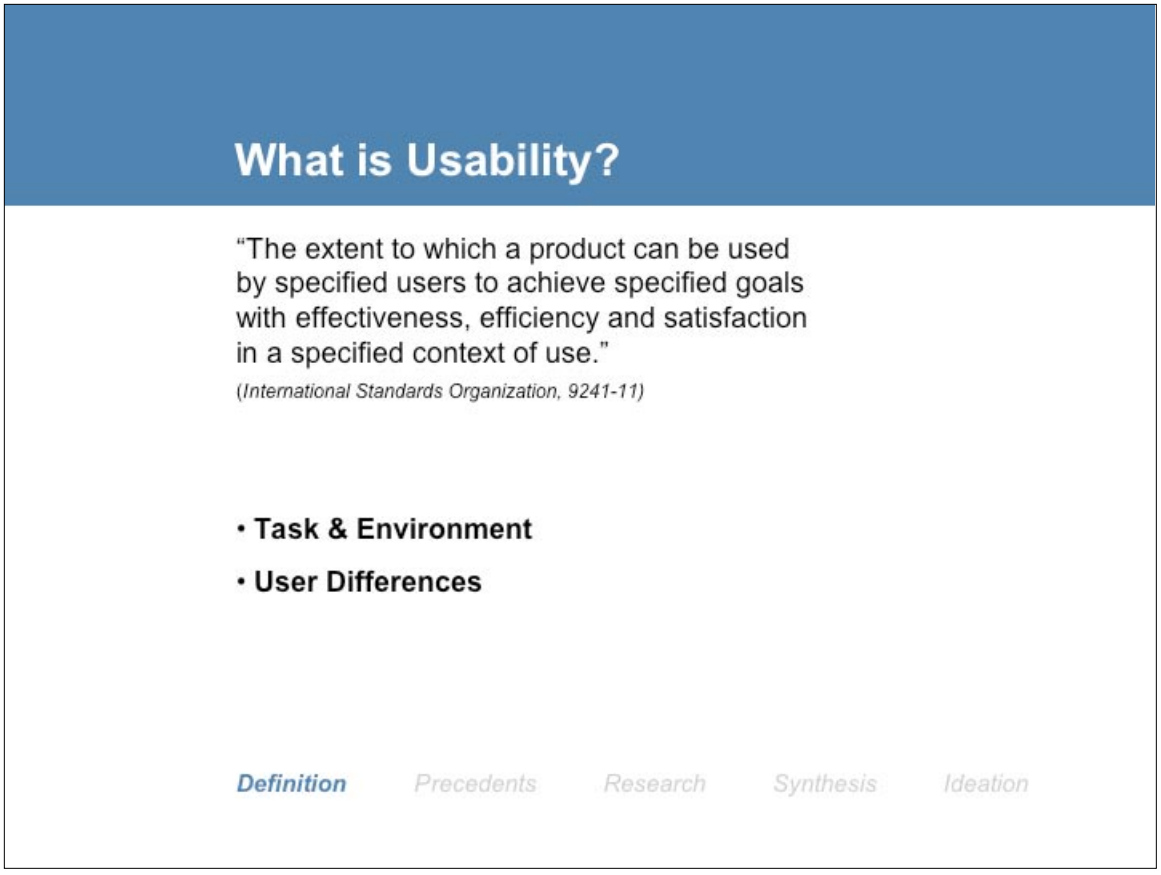


Folded Flat Inside Six-panel Spread

Back Cover

Appendix F
Thesis Peer Presentation (Powerpoint format, Winter 2006)





Appendix F (continued)
Thesis Peer Presentation

What is Variable Data Print (VDP)?

A form of digital printing involving a layout with variable content areas that can be customized according to certain rules which then incorporates data from a database or digital asset repository to be integrated into the document just before it is printed.
(*http://www.adobe.com/products/vdp/*)

- **Digital, On-Demand Printing**
- **Variable Components**

Definition *Precedents* *Research* *Synthesis* *Ideation*

Combining Graphic Design, VDP, and Usability

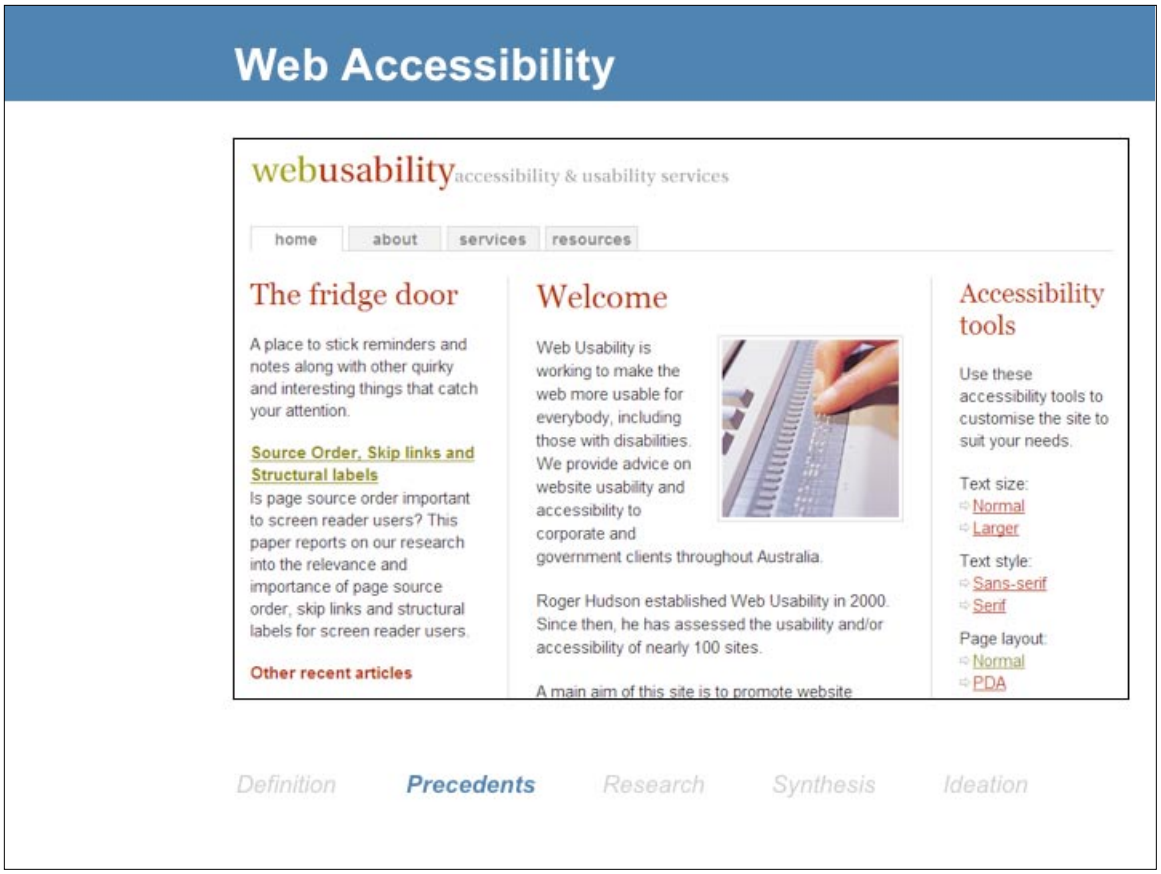
Variable Design Elements
Layout and Sequence
Typographic Decisions
Content Choices

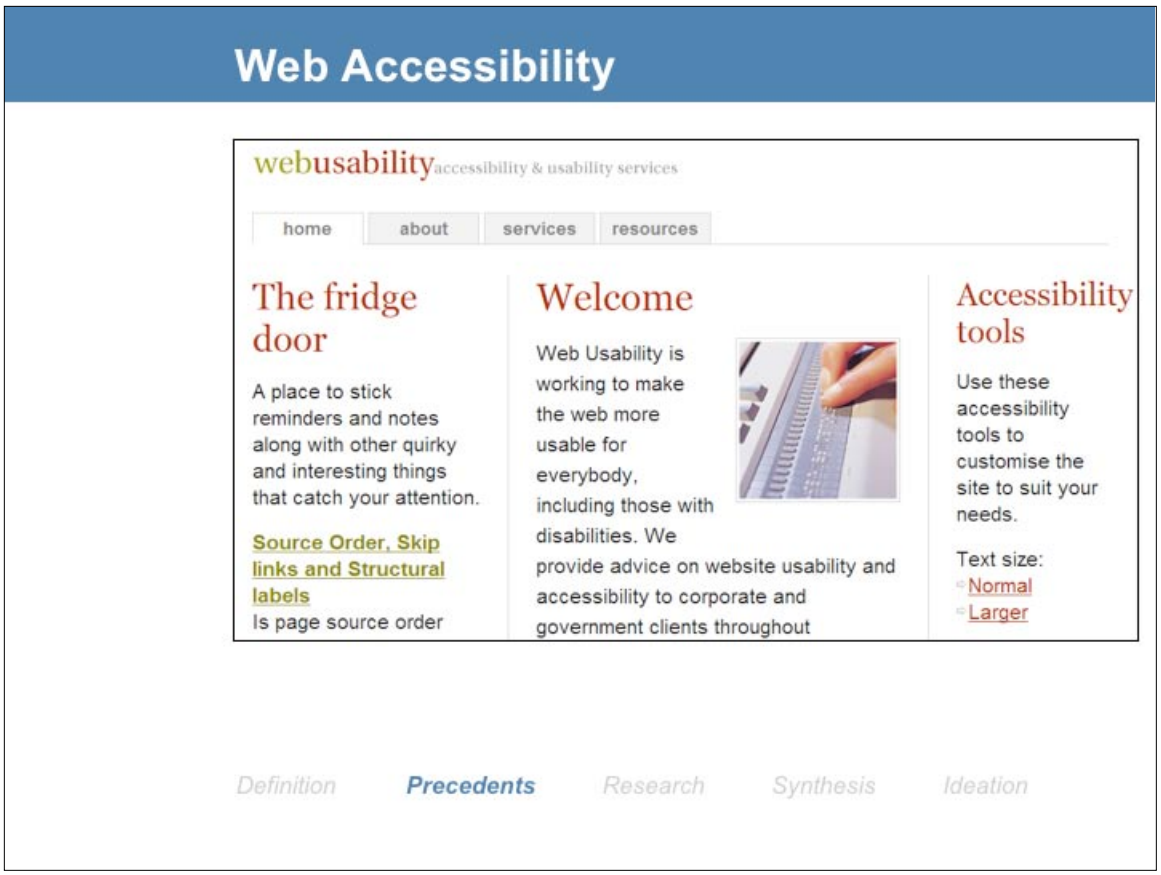
Adjust Design for Contextual and User Differences
Task / Goal
User Experience
Environmental Factors

Visual and Cognitive Abilities
Learning Differences
Cultural Conventions

Definition *Precedents* *Research* *Synthesis* *Ideation*

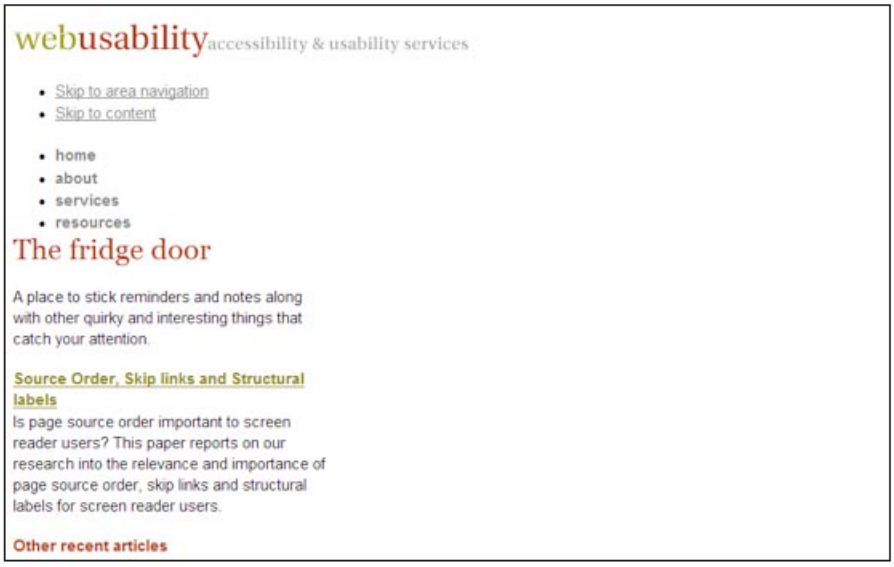
Appendix F (continued)
Thesis Peer Presentation





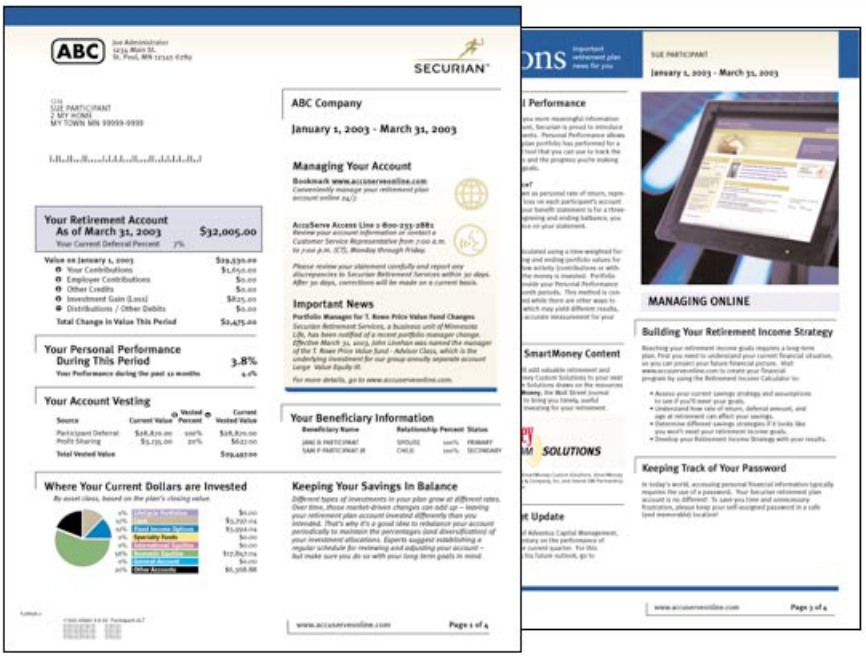
Appendix F (continued)
Thesis Peer Presentation

Web Accessibility



Definition **Precedents** Research Synthesis Ideation

VDP Educational Newsletter



Definition **Precedents** Research Synthesis Ideation

Appendix F (continued)
Thesis Peer Presentation

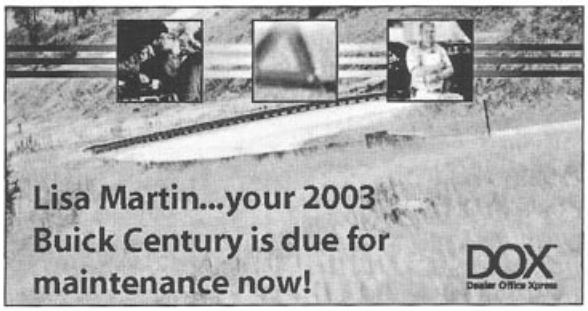
Customization Research

Customization
Collection of broad range of examples

Variable Data Print
Types of Print Customization
Workflow & Conditional Logic
Language Translation

Definition Precedents **Research** Synthesis Ideation

Variable Data Print



Definition Precedents **Research** Synthesis Ideation

Appendix F (continued)
Thesis Peer Presentation

Customization

Definition Precedents **Research** Synthesis Ideation

Customization

Definition Precedents **Research** Synthesis Ideation

Appendix F (continued)
Thesis Peer Presentation

User Differences Research

Usability
Definitions
Aspects

User Differences
Visual and Cognitive Abilities
Multiple Intelligences and Learning Styles
Language and Culture

Accessibility
Disabilities and Impairments

Universal Design

Definition *Precedents* ***Research*** *Synthesis* *Ideation*

Graphic Design Research

Typography
Variables
Hierarchy
Legibility

Systems Design
Spatial
Typographic
Language

Grid Systems

Gestalt Principals

Definition *Precedents* ***Research*** *Synthesis* *Ideation*

Appendix F (continued)
Thesis Peer Presentation

Systems Design

Nutrition Facts
Serving Size 1 bar (48g)
Servings Per Container 12

Amount Per Serving	
Calories 200	Calories from Fat 74
	% Daily Value*
Total Fat 8g	**13%**
Saturated Fat 2.5g	**14%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 70mg	**3%**
Potassium 165mg	**5%**
Total Carbohydrate 26g	**9%**
Dietary Fiber 5g	**18%**
Sugars 11g	
Protein 8g	**16%**
Vitamin A 0% • Vitamin C 0%	
Calcium 2% • Iron 10%	

Valeur nutritive
pour 1 tasse (264g)

Quantité	% valeur quotidienne
Calories 260	
Lipides 13g	20%
Saturés 3g + Trans 2g	25%
Cholestérol 30mg	
Sodium 660mg	28%
Glucides 31g	10%
Fibres 0g	0%
Sucres 5g	
Protéines 5g	
Vitamine A 4% • Vitamine C 2%	
Calcium 15% • Fer 4%	

Nutrition Facts
Serving Size 1/4 pizza (121g)
Servings Per Container about 4

Amount Per Serving	
Calories 270	Calories from Fat 80
	% Daily Value*
Total Fat 9g	**13%**
Saturated Fat 4g	**20%**
Trans Fat 0g	
Cholesterol 25mg	**9%**
Sodium 530mg	**22%**
Total Carbohydrate 34g	**11%**
Dietary Fiber 2g	**7%**
Sugars 1g	
Protein 14g	
Vitamin A 6% • Vitamin C 4%	
Calcium 20% • Iron 15%	

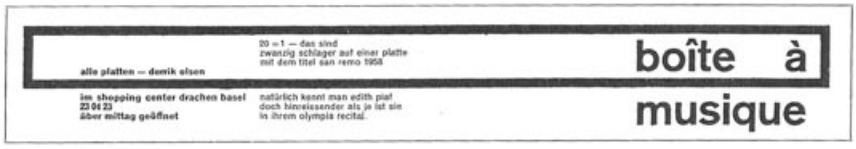
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

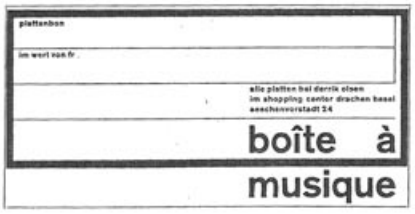
	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Definition Precedents **Research** Synthesis Ideation

Systems Design

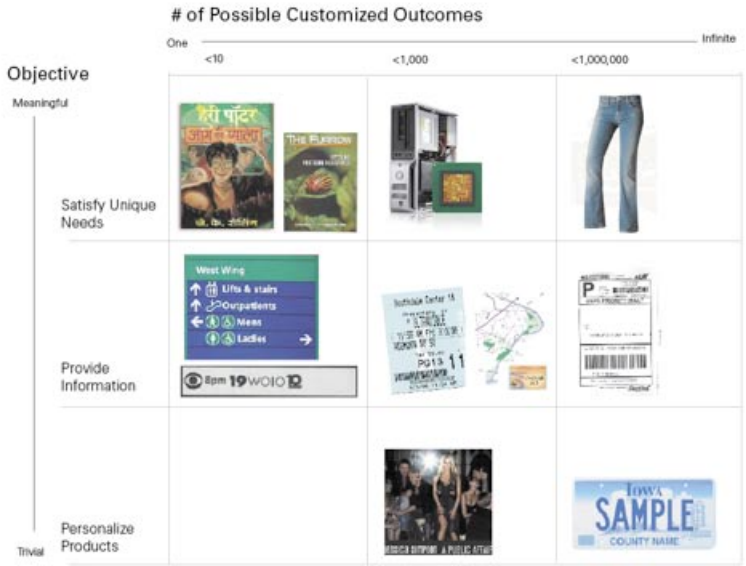




Definition Precedents **Research** Synthesis Ideation

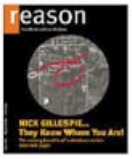
Appendix F (continued)
Thesis Peer Presentation

Matrix A: Customization Goals and Degree



Definition Precedents Research ***Synthesis*** Ideation

Matrix B: Customization Examples & Usability Analysis

	Customized Elements	Extent of Customization	Usefulness Value and completedness	Efficiency Speed and accuracy	Satisfaction Likability and comfort	Forgiveness Error prevention and recovery	Learnability Initial and deepening understanding
Provide Information							
	Amenities Locations Services	Unique Locations (100s of possibilities)	●	●	•	●	●
	Account Info Balances Transactions Summaries	Unique to each Customer (10,000,000s)	●	●	•	·	●
Sell Products or Services							
	Name Home Location	Unique Names (10,000,000s) Homes (10,000,000s)	·	·	●	·	●

Definition Precedents Research ***Synthesis*** Ideation

Appendix F (continued)
Thesis Peer Presentation

Matrix C: Semantic Operations

Subtraction
taking something away

User Differences		
Learned	**Innate**	**Situational**
	Attention Span	
	Limits of Short Term Memory	Divided Attention
Readability	Cognitive Process-ing Difficulties	Low Motivation
Graphic Design		
Elements	**Principals**	**Methods**
Negative Space	Variation	
	Closure	

Addition
adding something new

Adjustment
changing an existing element

Substitution
taking something away and replacing it

Exchange
changing positions between existing elements.

Definition *Precedents* *Research* ***Synthesis*** *Ideation*

Matrix D: Design Strategies for User Difficulties

Differences		*Possible Difficulties*	*Design Strategies*
Inherent			
Learning	**Impairments**		
	ADD	learning by doing	pace, repetition
	Dyslexia	processing problems	info in different forms
			reduce visual distractions
Visual	**Impairments**		
	Low vision	legibility	type/background contrast
	Color blindness (Red/Green)		color value choice/contrast
	Age associated	reading small print	type size, typeface choice
Cognitive	**Impairments**		
	Short-Term Memory	trouble remembering	chunking
		solving problems	memory aids
		spatial memory tasks	consistency, word choices
			redundant coding methods
			simplification

Definition *Precedents* *Research* ***Synthesis*** *Ideation*

Appendix F (continued)
Thesis Peer Presentation

Application Criteria

Printed Material
Variable Data Print deals with customizing print, so the final application must relate to print.

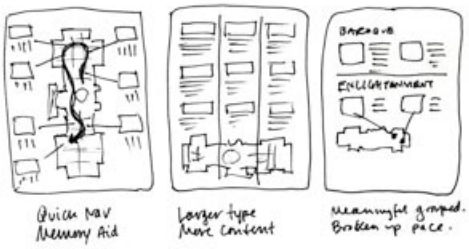
Large Audience
Considerable effort is put into developing a design system, so usage by a substantial number of people is desirable.

Diverse Audience
Productive customization requires a substantial number and diversity of different options.

Task Oriented
Usability considerations and measurability focus primarily tasks and how design helps users achieve their objective.

Definition *Precedents* *Research* *Synthesis* ***Ideation***

Museum Guide



Definition *Precedents* *Research* *Synthesis* ***Ideation***

Appendix G
MFA Thesis Exhibition Panels

The Impact of Variable Data Print on Usability in Design

William Wells
MFA Graphic Design

Definition

Overview

Introduction

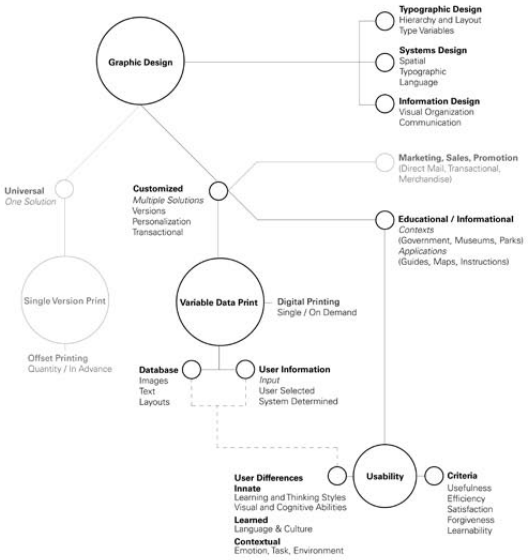
In a society where people see, process and remember information differently, the question arises: Is technology being used in a manner that acknowledges and addresses user differences to the fullest extent?

Currently, new print technologies like variable data printing (VDP) are only being used to create customized direct mailing pieces and personalized products for the purpose of marketing, sales and promotion. However, VDP introduces the ability to change data and design elements in printed documents on an individual basis, making it possible to address differences in visual and cognitive abilities, language and culture, and situational considerations.

Applying this concept of customization to print documents would allow a small amount of input from users to influence unique output (different sequences or layouts, typographic decisions and appropriate content choices) that are more relevant, usable and engaging.

While using VDP as a means to explore and achieve this customization, the focus of this thesis study would not be the technology, but the development of a graphic design strategy that accommodates this customization goal to make information more accessible and usable on an individual basis.

Explanatory Diagram



Appendix G (continued)
MFA Thesis Exhibition Panels

Objective

Usability

What is Usability?

Well-known for the development of standards for industrial processes and product quality, the International Standards Organization (ISO) defines usability as "... the effectiveness, efficiency and satisfaction with which specific users can achieve specified goals in a particular environment."

The expanded dimensions of usability to the right were compiled from two additional sources, an article by Whitney Quesenbery, *The Five Dimensions of Usability* and the Usability Professionals' Association *Usability Body of Knowledge* project.

They provide a broader definition of usability that moves beyond simply focusing on task performance to incorporating considerations of the entire user experience.

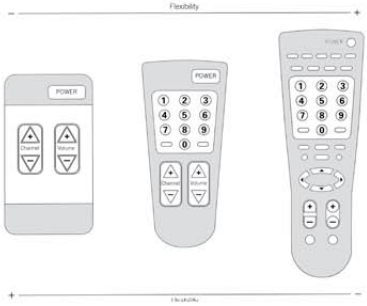
Usefulness
The degree to which the design helps the user achieve their goal.
relevant, helpful, complete

Efficiency
The degree to which the design facilitates speed and accuracy.
consistent, supportive, visible

Satisfaction
The degree to which the design makes the user feel comfortable.
attractive, credible, respectful

Forgiveness
The degree to which the design prevents errors and helps users recover from those that do occur.
validation, feedback, reversible

Learnability
The degree to which the design supports both initial orientation and deepening understanding of capabilities and content.
self-evident, intuitive, shortcuts



This example from *Universal Principals of Design* by Lidwell, Holden and Butler demonstrates the trade-off between ease of use and efficiency to added functionality and relevance. By customizing design for the purpose of usability this thesis study aims to achieve the best of both worlds.

Which User Characteristics Affect Usability?

Understanding the differing abilities and challenges people face when using printed materials is vital to addressing their needs which in turn increases usability.

Thus, determining and organizing the range of user traits and abilities related to print design was an important part of the research in this thesis.

Inherent
Inherited or developed physical and cognitive traits

- **Visual Impairments** — Low Vision, Color Blindness
- **Learning Disabilities** — ADD, Dyslexia
- **Cognitive Abilities** — Memory, Perception, Attention Span

Learned
Acquired or conditioned language or social tendencies

- **Education** — Vocabulary, Reading Level, Literacy
- **Culture** — Standards, Values, Schema
- **Language** — Conventions, Translation

Situational
Circumstantial or imposed task and environmental factors

- **Task** — Goal, Time, Past Experience
- **Environment** — Lighting, Distance, Materials
- **Emotions** — Attitude, Expectations

How will Customization Help Usability?

A range of examples were collected, from music and clothing to postcards and magazines, allowing for greater insight into customization in the broadest sense.

It was discovered that in cases where personal information was the primary content being changed, added value was focused on creating likability and relevancy. In cases where the aim was the customization of how information was presented, such as varying typographic variables, the focus was on usefulness and efficiency.

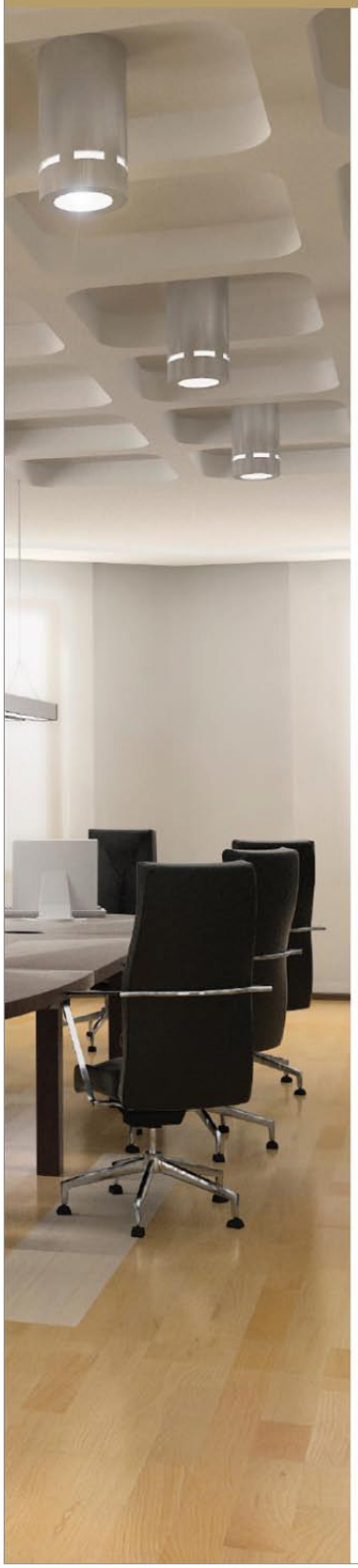
Key
Customization helped
Tremendously
Substantially
Somewhat
Not at all

	Usefulness Value and completeness	Efficiency Speed and accuracy	Satisfaction Likability and comfort	Forgiveness Error prevention and recovery	Learnability Initial and deepening understanding
Reader's Digest Same format and content but with larger print.	Tremendously	Tremendously	Tremendously	Somewhat	Somewhat
Reason Magazine Personalized cover with aerial photo of subscriber's home	Somewhat	Somewhat	Substantially	Somewhat	Substantially
Vanity Plates Vehicle license plate characters are chosen as desired	Substantially	Tremendously	Substantially	Substantially	Substantially
Dell Computers Components are mixed and matched online as desired	Somewhat	Substantially	Substantially	Somewhat	Somewhat

Appendix G (continued)
MFA Thesis Exhibition Panels

Means

Graphic Design



How will Graphic Design be Used?

This thesis uses graphic design as a mediator between usability and VDP. Graphic design is both the element that gets varied and the element that addresses usability. In doing so it also has the opportunity to visually unite the designs being produced.

Changing Elements that Address Usability
A few examples of ways that design elements could be adjusted to aid users and usability include: addressing engagement by varying choice of language, style of interaction or visual layout, and ease of use by incorporating knowledge of a user's background or experience and providing the correct level of depth to the content.

Maintaining a System by Using a Grid
The grid offers a strong yet flexible way to unify a set of varying designs. Clear proportions, spaces and guides are established by implementing an underlying grid upon adjustable design elements. Grids establish rules and constraints on various graphic variables that ensure consistency among the set of possible layouts.

This example from Karl Gerstner's book, *Design Programmes*, demonstrates how a carefully devised graphic design system can maintain an identity across variable circumstances.

What Elements of Graphic Design will Help Usability?

It is clear that the design of a document plays a role in how it is used, but which aspects of graphic design are involved?

Based on knowledge gained from previous knowledge and research findings, an organized list of graphic elements that are useful to addressing usability was created and summarized to the right. Key research sources included Karen Schiver's book *Dynamics in Document Design: Creating Text for Readers*, and Rolf Rehe's book *Typography: How to Make it Most Legible*.

It includes three main areas of graphic design and the components of each that have relevance to making documents more usable.

Gestalt Principles	Proximity Figure / Ground Continuation Closure Similarity
Typographic Design	**Type** Size, Weight, Face, Color Hierarchy Rules, Alignment
Systems Design	**Spatial** Grids, Zones, Composition, Proportions **Language** Structure, Patterns, Complexity

How could Graphic Design Decisions be Customized?

Looking at the elements, principles, and methods that graphic design employs and the relationships to the semantic operations helps develop an understanding of what ways they can be customized.

A corresponding table was created with possible user challenges to using print documents. The shared operations between user challenges and graphic design elements helps link user needs to actual graphic design tools.

The five basic semantic operations are subtraction, addition, adjustment, substitution and exchange.

	Subtraction remove element	**Addition** add new element	**Adjustment** change existing element	**Substitution** replace with new element	**Exchange** switch existing elements
Elements	Negative Space	Typographic Rules	Type Size & Weight Typeface Colors		Columns Figure / Ground
Principles		Emphasis Focal Point Repetition	Similarity Scale Contrast		Pattern & Rhythm Sequence Continuation Proximity Alignment
Methods	Variation Closure	Redundant Coding Methods	Hierarchy Modules	Clustering Information Zoning Written vs. Visual Explanations	Grouping

Appendix G (continued)
MFA Thesis Exhibition Panels

Vehicle

Variable Data Print

What is Variable Data Print (VDP)?

The Adobe Variable Data Publishing Resource Center defines VDP as a "form of digital printing involving a layout with variable content areas that can be customized according to certain rules. It incorporates data from a database or digital asset repository into the document just before it gets printed."

With the advent of electronic documents and digital printing it is now possible to create documents on a one-to-one basis. Using this one to one approach means that each print can have parts unique to an individual, from simply a name to a detailed statement history. Currently, this kind of customization is being used to help businesses get better response rates from mailings, command more attention from marketing pieces, and generally increase return on investment.

The list below explains the different types of VDP and their varying degrees of customization.

Versioning
A few versions based on geographical location

Mail Merging
Single document customized with name and address

Personalized Printing
Targeted offers based on recorded purchasing history

Transactional
Billing statements with monthly purchases and totals

Print on Demand
Templates with field-based customized content

This direct mailing example from the automotive industry illustrates how information about a customer can be used to personalize communication.

How does VDP Work?

The VDP workflow has several elements that make it different from a traditional static print document workflow. To the right are the main components and how variable document creation differs.

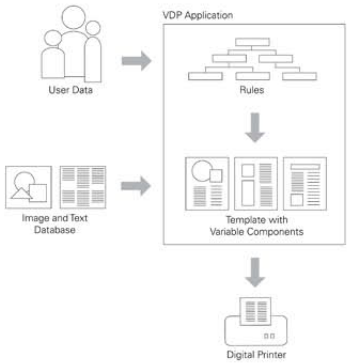
Content
Instead of being based on general traits of a target user group, variable data documents are based on information known about an individual

Decisions
In addition to content and layout decisions made by a designer, rules determine some of the content

Graphics
Normally embedded in a document, variable printing can also store images outside the document

Layout
While much of the layout for variable data documents is fixed, it also has variable text areas

Printing
Static documents output a single version while variable data documents output many unique versions, often reusing shared elements

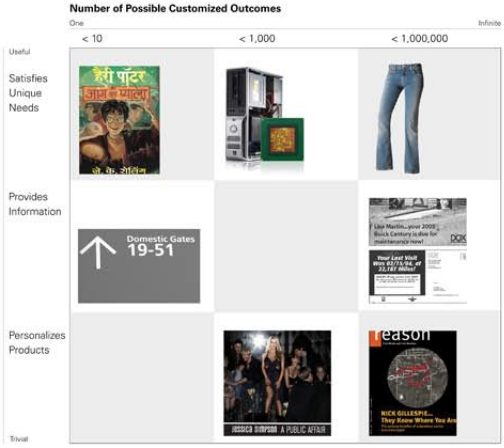


What Degrees of Variability would be Useful?

This matrix was assembled to explore the relationship between degrees of customization and the meaningfulness of customizations. It provides a comparative view of customization examples in order to assess what an appropriate balance of objective to amount of customization might be.

In the top left corner the products all achieve relatively useful objectives with only a few variations. In the bottom right corner, the high degree of customization of the products provides relatively little actual benefit to the user.

Clockwise from top left:
Harry Potter book translations, Dell custom computer choices, Levi's custom fit jeans, personalized car dealership postcard coupon, Reason magazine personalized aerial map cover, Jessica Simpson song with name substitutions and site specific wayfinding signage.



Appendix G (continued)
MFA Thesis Exhibition Panels

Progress

Application

Criteria

Printed Material
Variable data printing deals with customizing print documents , therefore the final application must relate to print.

Large Audience
Considerable effort is put into developing a design system, so use by a substantial number of people is desirable

Diverse Audience
Productive customization requires a substantial number and diversity of different options

Task Oriented
Usability considerations focus on user tasks and how design helps users achieve their objectives

Museum Guides

To satisfy all four criteria identified, museum guides were chosen. Musuem guides help a large and diverse audience explore and learn about musuem collections.

As the primary printed material that a museum offers, guides often serve a substantially large and diverse audience. The range of ages, educational backgrounds, cultures and user goals lend themselves very well to the variability and user-centered focus of this thesis. In addition, this substantially large and diverse audience makes the design and implemention of variably printed museum guides more useful and cost effective.

George Eastman House

The George Eastman House was selected as the content of the final application because it satisfied all the requirements for appropriate location; a large and diverse audience, depth and richness of content and a need for improvement in the current guide to address user differences better.

Audience
As an internationally known museum of photography it serves a large and wide ranging audience, from local researchers to foreign tourists.

Content
In addition to being a museum with a historic house and gardens, it is also has permanent galleries and travelling exhibits, a film theatre and an extensive film archive and collection.

Need
The current guide offered provides an overwhelming collection of information. While smaller alternate guides are available in other languages, the main guide does not address differences in visitor backgrounds and objectives.

Preliminary Application Ideation

Illustrative exmaples based on age, time contraints and visit goal.

User 1
Older Adult, All Day, Tours

User 2
Adult, Half Day, Research

User 3
Teenager, Couple of Hours, Exhibits

Existing Guide Design